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Stephenson and the Rainhill Trials

ONE hundred years ago from October 8 to 14, occurred the famous Rainhill trials conducted in England on the Liverpool & Manchester Railway, then under construction, which established beyond all doubt the future of the railroad as the principal medium of inland transportation and of the steam locomotive as its source of hauling power. These trials did not mark the invention of the steam locomotive, nor did they mark the beginning of its commercial application. George Stephenson himself had developed and used locomotives in tramway haulage between the mines and the River Tyne in England over a considerable period of years, beginning in 1814. The success of the "Rocket," which won the prize offered by the directors of the Liverpool & Manchester, was the fruit of these years of experience of George Stephenson and his son, Robert, in building and in operating steam locomotives for this specialized type of haulage, as well as of the mature judgment of George as to the economic possibilities of steam motive power for general rail transportation purposes.

Considering the tremendous importance of the outcome of the Rainhill trials in firmly establishing the future of the steam railroad as a saver of time and an annihilator of distance, we are printing elsewhere in this issue an article in which Herbert T. Walker reviews the intensely interesting career of George Stephenson and describes the Rocket and its performance.

Steam railroad transportation in America is now in the midst of a period of centenary anniversaries. Several railroads have already passed the century mark. Notable among these is the Baltimore & Ohio; not only the railroad itself, but the present corporation, had its inception in 1827. The "Tom Thumb," credited with being the first locomotive built in America, ran on the rails of the Baltimore & Ohio within a matter of a few months following the Rainhill trials. John Stevens had operated a model of a steam locomotive at Hoboken, N. J., in 1825, as a part of a campaign which he had long conducted to interest the states of New York, New Jersey and Pennsylvania in the building of railroads. The Delaware & Hudson, then the Delaware & Hudson Canal Company, had imported the "Stourbridge Lion" from England and it had made its demonstration run on a short section of track near Honesdale, Pa., a few months prior to the date of the Rainhill trials. None of these locomotives, however, was very practicable, mechanically; their practical results were confined to the development of a wider interest in America in the problems of producing better machines. At the Rainhill Trials Stephenson presented a locomotive possessing the fundamental elements of boiler capacity which have been essential features of all later steam locomotives. The Rocket demonstrated with finality, that speeds higher than the reaches of the popular imagination of that day were entirely practicable mechanically.

The significance of the Rainhill trials is not alone the result of the success of the Stephensons (father and son) as designers and builders of locomotives. It is perhaps as much due to George Stephenson's experience and ability as a pioneer railroad builder, a phase of his career which has been obscured by the association of his name with the Rocket.

As pointed out in the article already referred to, George Stephenson was the chief engineer in charge of building the Liverpool & Manchester Railway, and this was the second major project of this kind with which he had been thus connected. As the result of his earlier experience in operating steam locomotives in mine haulage, he had learned both the possibilities and limitations of traction by means of smooth wheels on smooth rails; he had learned the importance of the elimination of gradients to the fullest possible extent in the construction of railroads or tramways, whether the motive power was to be steam or horses. In these respects he was considerably in advance of the engineering ideas of his time. His knowledge of the economics of railroad transportation and his success in securing the support of the directors of the Liverpool & Manchester in carrying out his advanced ideas formed the foundation upon which the commercial success of the application of the steam locomotive on the Liverpool & Manchester was built.

The writer of the article brings out a fact that is probably not very generally known: that George Stephenson shared the prize awarded by the directors of the Liverpool & Manchester with one of its officers, who suggested the idea of the multitubular boiler, a feature of the Rocket and its successors built by the

Stephensons which played no small part in the ability of these locomotives to develop sufficient capacity to make them commercially practicable units. This, and the use of the exhaust steam to produce an induced draft are the two principal features which gave the Rocket a speed and capacity which left no doubt as to its vast superiority over other means of moving traffic in long distance transportation. Notwithstanding the share which others had in making the Rocket itself a success, however, George Stephenson merits all the credit he has received for his connection with the Rainhill trials. His persistence in advocating the use of the steam locomotive as the motive power for the new railroad throughout the construction period had much to do in influencing the directors of the Liverpool & Manchester to authorize the Rainhill trials.

The Car Foreman and Brake Maintenance

IN one of the ablest papers presented before the Car Foremen's Association of Chicago last season, L. M. Carlton, mechanical expert of the Westinghouse Air Brake Company, urged that car foremen do not overlook the importance of air-brake maintenance in properly apportioning their time between many widely varying activities and responsibilities. He explained the advantages of keeping regular, properly-trained employees on brake maintenance work and encouraging apprentices to learn as much as possible about brake operation, maintenance and testing. Car foremen, themselves, need not necessarily be technical air-brake experts but should have a working knowledge of the brakes in order to supervise air-brake testing and maintenance work effectively, correct local conditions justly criticised, defend their own departments against criticism for conditions over which they have no control and enable them to answer intelligently and concisely all correspondence regarding air-brake matters.

The Bureau of Safety and the Mechanical Division rules governing the maintenance of air brake and signal equipment represent the minimum requirements and, with the active support and interest of car supervisors, are not only fairly easy to observe but are responsible to no small extent for the present improved status of air-brake operation. Appealing for continued improvements in maintenance standards, as fostered by the present regulations governing annual inspection and conditioning operations, Mr. Carlton says: "How is the car foreman to know that air brake maintenance is keeping pace with the requirements? Do you wait until the complaints from other places reach you, and then get busy, or do you make occasional tests of several stenciled triple valves in the air brake room? Do you occasionally make tests of several 'annually maintained' or 'in date tested' cars? Do you occasionally check up on the condition of test racks, yard test trucks or single-car testers? If not, you are failing to take the interest you should and are losing much valuable information by which you could profit. These tests should be open; all workmen to know about them and understand that memoranda will be made of what is found, with credit given for work well done."

Car foremen can, perhaps, perform no greater single service in the interests of improved air brake maintenance and operating conditions than to check their source of air supply and make sure that an adequate amount of dry air at uniform pressure is available. This is particularly necessary for yard charging and testing lines because water interferes with the triple-valve lubrication and when the temperature drops below freezing, ice is formed and produces erratic air-brake action.

Insufficient or extremely variable air pressures are not conducive to effective testing. For single-car testing, for example, with freight brake equipment, a line pressure of 70 lb. per sq. in. is usually required, and this pressure should be held practically constant during any test period. Suppose, for example, that a release test is being made following a 15-lb. reduction in brake-pipe pressure. If the line pressure increases before the release is made, a driving head of 20 lb. per sq. in. or more of air pressure will pass a defective triple valve, whereas a reduction in line pressure, possibly reducing the driving head to 10 lb. per sq. in., presents an unnecessarily severe test and will probably result in condemning triple valves which, when removed and taken to the test rack, are found to meet the release test satisfactorily. Where yard line pressures are high and variable, the difficulty can usually be solved by placing a carefully maintained and regulated reducing valve in the yard line and setting it at the desired brake-pipe test pressure.

In closing his address, Mr. Carlton well stressed the importance of car foremen welcoming the visits of the general air brake inspector or supervisor who, with his specialized experience, is not only desirous but well fitted to help solve air brake difficulties. It will also unquestionably be helpful for car foremen to call the attention of their superiors occasionally to local conditions which make proper brake maintenance difficult. The higher the rank of car-department officers, the more they realize the necessity of keeping everlastingly at this problem of air-brake testing and maintenance and the more willing they are to listen to recommendations which hold promise of further improvement.

The Annual Meeting of the A. S. M. E.

APPEARING in the news section of this issue are two items that pertain to the railroad activities of the American Society of Mechanical Engineers. One of the items gives the results of the election of officers for the Railroad Division, while the other announces the consolidated program of papers, considered to be of interest to railroad mechanical department officers, that are to be presented during the annual meeting of the society, December 2 to 6, 1929. At the present time the Railroad Division is one of the strongest and the best organized of any of the professional divisions in the society. During the past year, the registration in the Railroad Division has increased from 1,131 to 1,200. Four years ago the registration in the division was slightly over 400.

Only six of the papers included in the program for the annual meeting in December are strictly railroad papers. These papers are to be presented at sessions of the Railroad Division. The other papers are on subjects pertaining to heat treatment of steel, machine-shop practice, material handling, etc., and have been selected from the annual meeting program by a committee of mechanical engineers employed in both the railroad and

railway supply industries as being of more or less interest to men engaged in the manufacture and maintenance of railroad equipment, appliances or materials.

The railroads of the United States are passing through a period of transition in which the tendency to concentrate repair work at large shops having modern facilities and layouts is the important development. This makes it more necessary than ever before that mechanical department officers go outside of their own shops to study the methods and processes used in other industries, the work of which presents problems similar to those found in maintenance of equipment work. This applies particularly to the utilization and development of machine tools and shop equipment. Important developments have occurred during the past year in the manufacture and use of high-speed cutting tools. Six papers and reports on different phases of this subject are included in the program. The annual meeting this year should attract a large attendance of railroad mechanical department officers.

Further Enginehouse Economies

AT a recent staff meeting of locomotive department supervisors on a large railroad system in the west, several highly pertinent suggestions were advanced regarding ways and means by which additional economies can be secured in enginehouse operation and locomotive maintenance. Without doubt, the most important single opportunity is afforded by the more general extension of locomotive runs which decreases the number of power units required to be handled at individual terminals with consequent important savings in labor, material and fuel. Without constant watchfulness, there is a tendency to maintain a greater number of locomotives at engine terminals than the service actually requires and this means an unnecessary expense in all the items of enginehouse operating cost, including both maintenance and general conditioning operations.

While much has been accomplished in increased power utilization, the surface has in reality been little more than scratched as regards potential economies which can be realized. Particularly in large terminals, road power can often be handled in such a way as to institute turn-around runs and utilize locomotives from one division for short trips on connecting divisions with a resultant increase in mileage and reduced number of locomotives required at individual terminals. With the co-operation of the operating department, switching power also can frequently be assigned so as to reduce peak demands and, therefore, the total number of locomotives required for switching and transfer service at individual terminals. In addition to the saving in enginehouse expense, there is the further advantage that, with fewer locomotives in active service, the chances of failure are proportionately reduced and general locomotive maintenance expense is decreased.

Experienced locomotive department officers, at the meeting referred to, mentioned the systematizing of forces and engine terminal operations as the second feature in importance in any attempt to minimize engine terminal expense. There can be no question that, with the assignment of regular duties to individual employees and operations co-ordinated in such a way as largely to avoid an accumulation of maintenance work until it must all be done in a short period with a comparatively large force of men, much can be accomplished in reducing the total amount of enginehouse labor required.

The importance of avoiding slipshod repair methods and, so far as possible, making permanent repairs, can hardly be overemphasized, in view of the cost of taking locomotives out of service for emergency work. Enginehouse foremen have an excellent opportunity to improve the quality of the service rendered by impressing upon mechanics under their supervision the absolute necessity of thoroughly good workmanship, particularly on inaccessible parts which, if not correctly repaired and applied in the first place must subsequently be removed, with a large expenditure of time and labor for removing and re-applying auxiliary parts. Material performance should also be studied. In cases where the material cost of a repair job involves but a small proportion of the labor cost, it is poor economy to apply anything but the most durable material, practically irrespective of cost. This is particularly true of such material as driving box brasses, etc.

As regards the policy of giving locomotives a thorough inspection and overhauling at the regular monthly inspection period at engine terminals, it may well be questioned if this results in an actual reduction of engine terminal expense. There is no doubt, however, that from the point of view of locomotive serviceability and earning power, this practice is justified.

Additional economies can be effected by making sure that locomotives at engine terminals are carefully and intelligently handled by hostlers, firemen and road crews, because a little carelessness in starting an air pump, for example, or moving a cold locomotive, may well cause a subsequent failure, road delay and unnecessary maintenance expense. Usable material in excess of the requirements on a particular job can, by a little effort, be directed back into the store-room instead of allowing it to get into the scrap dock and thus cause unnecessary material expense. While the enginehouse foreman's primary responsibility is to "get out the power," it may truly be said that, in the way this objective is achieved, he has a fertile field of opportunity to waste or save money for his railroad.

New Books

PROCEEDINGS OF THE INTERNATIONAL RAILWAY FUEL ASSOCIATION. *Published by the International Railway Fuel Association, Chicago. 574 pages, 6 in. by 9 in., bound in leather.*

A brief account of the World Fuel Conference held at London, England, September 24 to October 6, 1928, at which H. W. Brooks, consulting engineer, represented the International Railway Fuel Association, is contained in the proceedings of the twenty-first annual convention of the International Railway Fuel Association held at Chicago May 7 to 10, 1929. The regular reports presented at this convention were on steam-turbine locomotives; Diesel locomotives; front ends, grates and ash pans; firing practice; fuel distribution and statistics; fuel conservation bulletins and cartoons; fuel stations; inspection and preparation of fuel; stationary power plants, both coal and oil-fired; and new locomotive economy devices.

The Centenary of a Famous Locomotive

With some notes on the lives of George and Robert Stephenson

By Herbert T. Walker

IN these busy days when stupendous engineering works are of common occurrence we are forgetting the early engineers, who, in the face not only of technical difficulties, but of fierce opposition and bodily fear, laid the foundation of our present gigantic system of steam transportation.

Before taking up a description of the locomotive engine, which one hundred years ago achieved what scientific men had proved by mathematics to be an impossibility, we will glance at the troubles of the old-time engineers, of which their modern brothers know nothing.

The present-day engineer cannot scheme anything that cannot be built. It is only a question of cost. But at the close of the eighteenth, and at the beginning of the nineteenth centuries our predecessors, while developing new ideas, were constantly asking themselves whether that which they wanted could be made. Workmen were dull and slow and the early engineers had to pull off their coats and show their men how to make things.

Many of the first locomotives were built in blacksmith shops connected with the mines where the crude pumping and winding engines were made and repaired. This brings us to the coal mines in the north of England where the village of Wylam is situated on the River Tyne, west of Newcastle. A few hundred yards from its eastern extremity stands a humble cottage which was the birthplace of George Stephenson, "the father of railways and the perfector of the locomotive." The lower room in the west end of this house was the home of Robert Stephenson, Sr., and his wife Mabel, and there George was born, June 9, 1781. The walls of the room are unplastered, its floor is of clay and the bare rafters are exposed overhead.

George Stephenson

"Old Bob," as his neighbors called him, was employed as a laborer at the colliery. As his wages were not more than twelve shillings a week and as there were five children besides George, there was little to spare for clothing and nothing for education, so none of the children could be sent to school.

Young George led the ordinary life of working people's children. When only eight years old, he herded cows at a wage of two pence a day, and here he began to make models of engines in clay from a nearby stream. He was quick-witted, with great powers of imitation. We next hear of him as a "picker" to clean the coal of stone, slate, etc., at a wage of six pence a day. Here, surrounded by coal dust, amid the slow, mournful throb and wheeze of the Newcomen pumping engines, the sharp blast of steam from the winding engines and other deafening sounds, to say nothing of the company of rough brutal men who never spoke without an oath and whose only way of settling a dispute was by personal combat, our future engineer worked his way up to the position of fireman at a shilling a day.

In his spare time his custom was to take an engine apart, examine and clean the pieces and put them together, getting his first lessons in mechanical construction. But he was now in his eighteenth year and could not read. He had heard of Boulton and Watt's engines and was told they were fully described in books. He then attended a night school, kept by a poor teacher, where he learned spelling and reading at a cost of three pence a week. He also mastered the rudiments of writing and, at the age of nineteen, was proud to be able to write his own name. Later he took advanced lessons and

it was found that George developed a remarkable capacity for arithmetic, so essential to him in his future profession.

And it may here be remarked that among the secrets of success in Stephenson's life was the quickness and industry with which he seized every opportunity to acquire knowledge. Again, he was always very much in earnest and ready to learn something from every man, high or low. He had a way of giving the closest attention to any one who talked to him. He was courteous and kindly and a natural gentleman.

At the age of twenty he held the responsible office of brakesman at twenty shillings a week. A brakesman had charge of a winding engine at the pit's mouth, by which the coal was drawn up from the mine in baskets held in a cage. When the cage appeared near the surface, the brakesman controlled the speed by the throttle valve and a brake applied to the flywheel by a treadle. Great care was required to stop and start the cage at the right place.

George was diligent and observant while at work and sober and studious when work was done. On Saturday afternoons when the pitmen were paid off they occupied themselves chiefly in cock fighting and dog fighting, followed by adjournments to the beer shops where they spent most of their wages. Prohibition was unknown and drunkenness was the curse of the British workman.

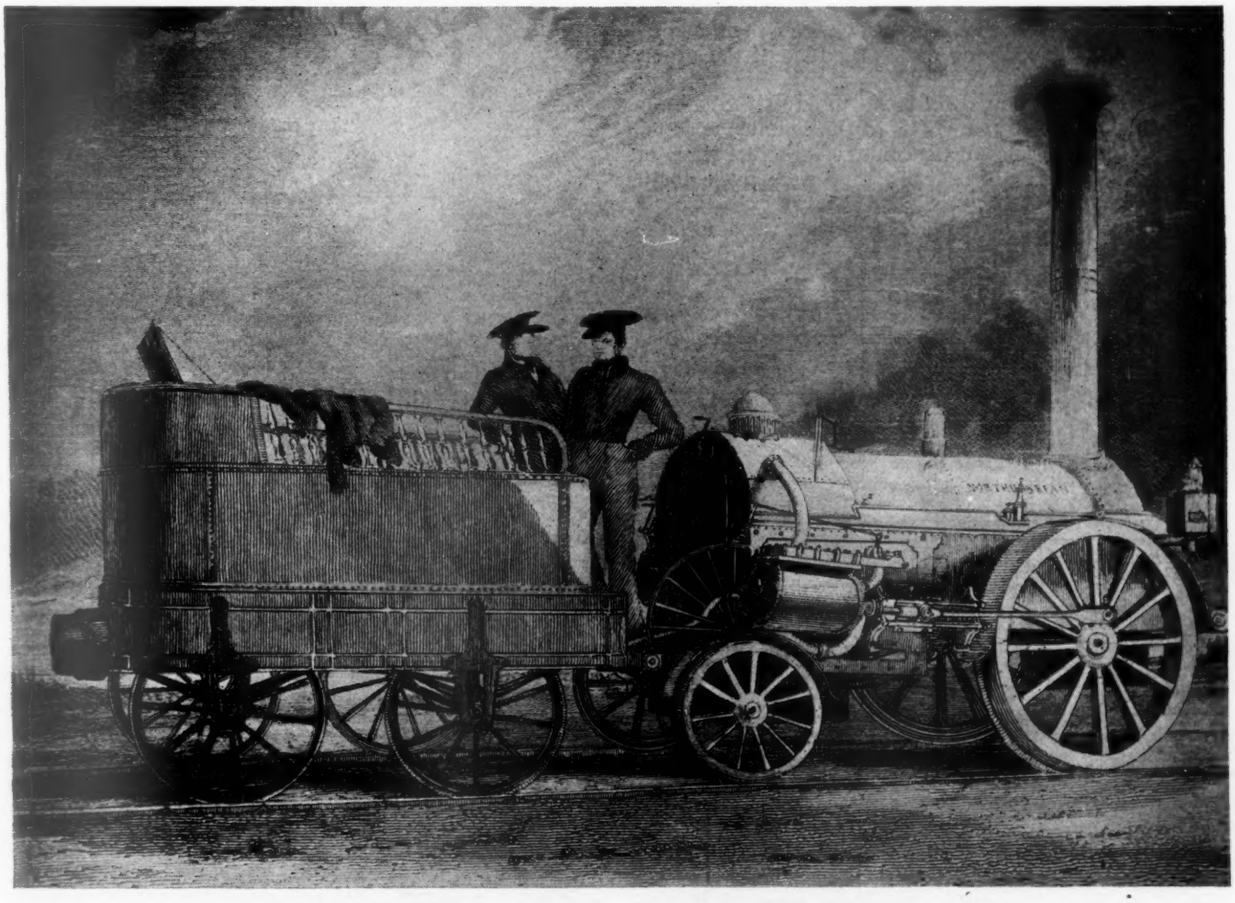
In 1802 George married Fanny Henderson, a domestic servant. She was a perfect wife. While sitting by her side in his cottage when the miners were singing, roaring and fighting in the beer shops, he was studying mechanical subjects and making experimental models. It was here that his son was born on October 16, 1803. The boy was christened Robert and he was destined to be his father's right-hand man, as we shall presently see.

We shall pass over the period when George continued to progress from driving stationary engines to the time when he built this machinery himself, adding improvements of his own, until the matter of locomotive engines entered his mind for serious consideration.

George Stephenson's First Locomotive

Stephenson did not invent the locomotive engine. That honor belongs to Richard Trevithick, a Cornish mining engineer, who, as far back as 1796, made models of engines adapted to run on roads and, later, on tramway plates. They may be fairly described as stationary engines on wheels, but his crude single-cylinder locomotives formed a starting point from which Blackett, Murray, Hedley and Hackworth built their original engines. Their chief improvements were the employment of two vertical cylinders instead of one, the piston rods being connected to the cranks by grasshopper beams. George examined them all and then built his first locomotive, which was run on the Killingworth Tramway in 1814, but his improvements over previous designs were slight, except that the vertical piston rods were connected by crossbeams to the driving wheels, eliminating the grasshopper beams. By 1822 five of Stephenson's engines were doing good work on the colliery tramways.

In 1818 Edward Pease and other enterprising men made application to Parliament to construct "a public railway" from Stockton to Darlington, and George



The Northumbrian—Liverpool & Manchester Railway, 1830

Stephenson was appointed engineer at a salary of £300 per annum. The bill was rejected twice, but it passed in 1821. It was intended to work the line by horse power, but George said that one of his engines was worth fifty horses. Strong objections were made to steam locomotives, but Stephenson invited Mr. Pease to "come over and see my engines at Killingworth. I will show the colliery books and you may ascertain for yourself the actual cost of working. The economy of the locomotive engine is no longer a matter of theory, but a matter of fact."

Stephenson Begins His Career as a Railroad Engineer

Pease went to Killingworth and was so satisfied with the performance of the engines that he had a clause inserted in the amended act, taking power to work the railway by locomotives and employ them for hauling passengers as well as freight. George then made a survey of the line, laying out every foot of the ground himself.

The track gage was determined to be 4 ft. 8½ in., as that was the gage of the wheels of the common road and tramway road vehicles of the country. So that when the cars were built to run on rails, they were made to the same gage.

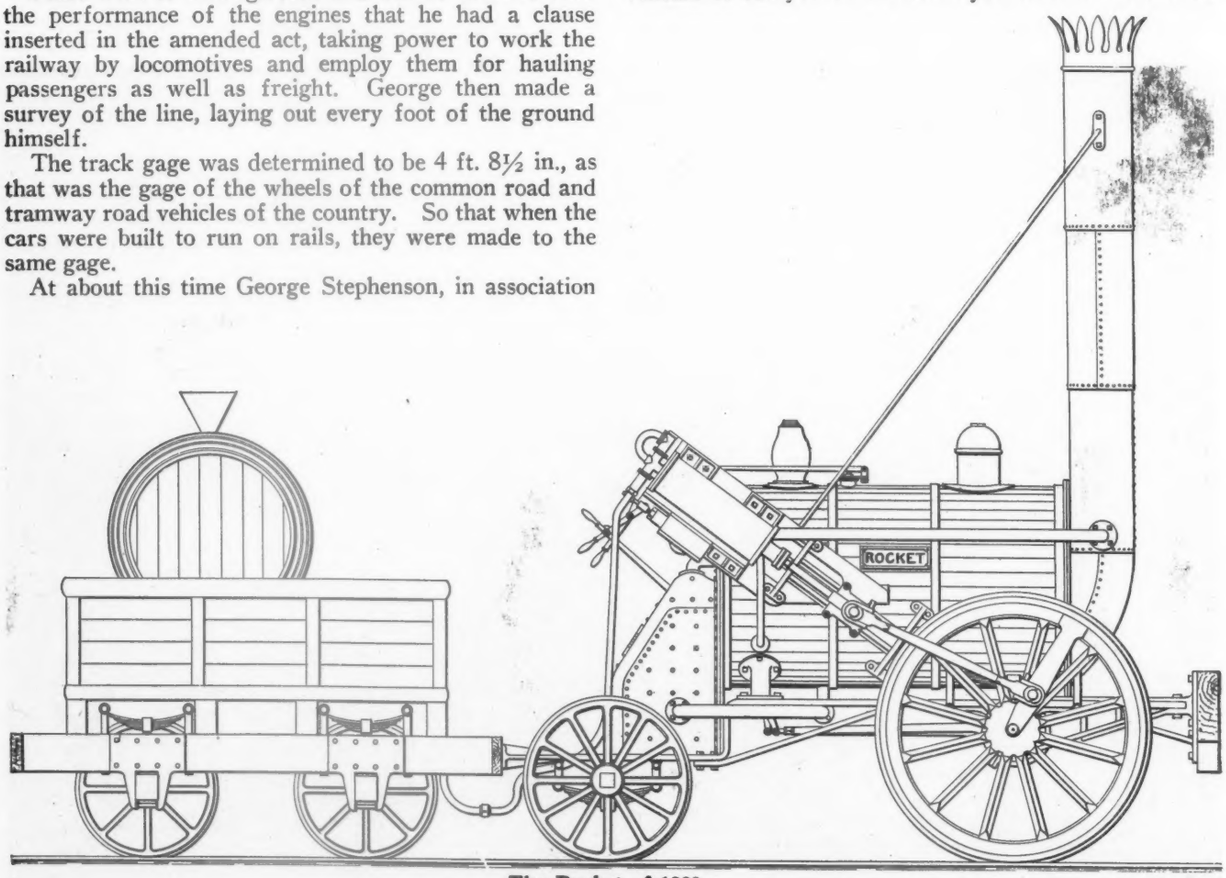
At about this time George Stephenson, in association with Messrs. Pease and Richardson, established a locomotive works at Newcastle, under the name of R. Stephenson & Co. Later the works were moved to Darlington where they are doing a prosperous business today under the name of Robert Stephenson & Co., Ltd.

Notwithstanding the success of Stephenson's locomotives, the public and the press were still in favor of horses. The "Tyne Mercury" of November 16, 1824, had an editorial as follows: "What person would ever think of paying anything to be conveyed from Hexham to Newcastle in something like a coal wagon, upon a dreary wagon way and be dragged by a roaring steam engine?"

In the face of opposition which we cannot understand in these days, the directors ordered three of Stephenson's locomotives against the opening of the railway.

These engines embodied all of Stephenson's improvements. No. 1 engine, named "Locomotion," had vertical cylinders, parallel motion, and the piston rods connected to four driving wheels four feet in diameter. The wheels were coupled by rods. Coupled wheels were claimed by Hackworth. The cylinders were 10 in. diameter by 24 in. stroke. The exhaust was discharged into the chimney and the draft was so strong that the chimney got red hot. The boiler was 10 ft. long by 4 ft. diameter, with one flue, giving 60 sq. ft. of heating surface. The weight of engine in working order was about six tons.*

When the line was nearing completion, George, with his son Robert, and Dixon, assistant surveyor, dined at one of the inns. After dinner George made a little speech. "Now lads," said he to the two young men, "I venture to tell you that I think you will live to see the day when railways will supersede almost all other methods of conveyance in this country—when mail coaches will go by railway and railroads will become the great highways for the king and all his subjects. The time is coming when it will be cheaper for a working man to travel on a railway than to walk on foot. I know there are great and almost insurmountable difficulties to be encountered, but what I have said will come to pass as sure as you now hear me. I only wish I may live to see the day, though that I can scarcely hope for, as I know how slow all human progress is and with what difficulty I have been able to get the locomotive introduced thus far, notwithstanding my more than ten years' successful experiment at Killingworth." In less than five years George's anticipations were fully realized.



The Rocket of 1829

The line was opened September 27, 1825. The train

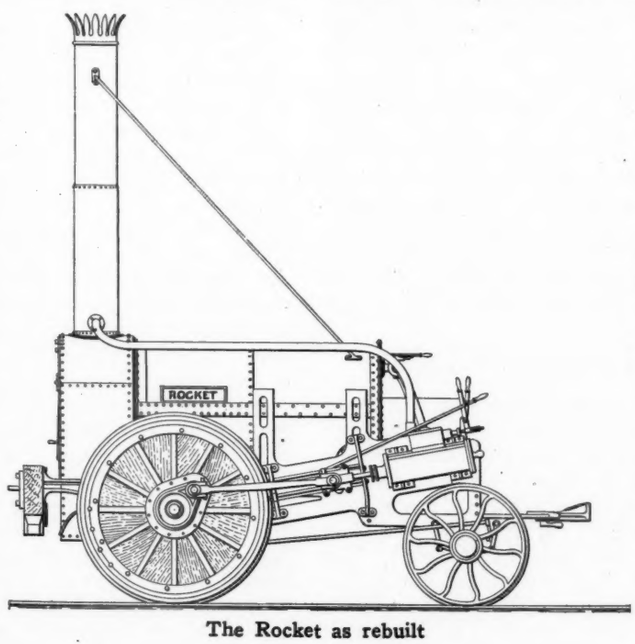
* All weights in the present article are given in long tons.

was hauled by Locomotion driven by George Stephenson. It consisted of freight and passenger cars crammed with 450 passengers; the total weight of the train was about 90 tons. The train was going about six miles an hour, when presently George "put on the steam" and 12 miles an hour was reached, and then 15. Some of the spectators wondered if the engine moved by lawful means.

This railway was a success from the start. The first year's receipts increased from £7,000 to £15,000 a month.

The Liverpool & Manchester

About this time the commercial men of Liverpool and Manchester were growing restless under the slow and expensive transportation of goods, principally by canal. It sometimes took longer to bring cotton from Liverpool to Manchaster, 30 miles, than it had done to bring it from New York to Liverpool by sailing ship. A survey had been attempted in 1821, but never completed, the country people, directed by the canal companies and landed proprietors, turning out to obstruct the surveyors, chasing them from the fields, and smashing their theodolites. A second survey was subsequently started by George Stephenson and William James, a surveyor, and Robert Stephenson as assistant. A part of the line would have to be built over Chat Moss, a spongy bog that appeared to have no bottom. Here came stronger opposition than before, George, himself, suffering violence from the land owner's servants and gamekeepers. Some surveying had to be done by moonlight.



The Rocket as rebuilt

When the Bill was in preparation the promoters engaged the most eminent counsel they could get. They were Mr. Serjeant Spankie, Mr. Adam, Mr. Brougham and Mr. Joy. When in consultation with them, Stephenson confidentially stated his expectation that his locomotives would run 20 miles an hour, Mr. Brougham instantly warned him in strong terms. "If," said he, "you do not moderate your views and bring your engine within a *reasonable* speed, you will damn the whole thing and you, yourself, be regarded as a maniac, fit only for Bedlam."

The Bill then went into the Committee of the House of Commons. The opponents had retained eight of the ablest members of the Bar, among them Mr. Alderson, who was skilled in practical science.

Evidence was taken as to the delays in forwarding goods between the two cities, and Mr. Adam made out a good case for the promoters. But when it came to proving the practicability of employing steam locomotives, the outlook began to look gloomy.

Public Opposition to Steam Railroads

When Stephenson was called into the witness box, he was confronted by the smartest lawyers of the day. This array of forensic talent in their wigs and black gowns disconcerted George, whose speech betrayed him as a north countryman, and whose frank, simple manner excited their sneers and ridicule. George afterwards said that the witness box was the most unpleasant of all positions. "I was not long in it before I began to wish for a hole to creep out at." Provoked by the insulting manners of these gentlemen—one of whom hinted that Mr. Stephenson was a madman, he lost his self-control and affirmed that his engine could go 12 miles an hour. This was seized on by the astute Mr. Alderson, who then made a brilliant speech condemning the whole system of steam locomotion and the promoters became seriously alarmed.

The moment Alderson sat down, Mr. Joy sought to palliate the unfavorable turn their case had taken and proceeded to re-examine Stephenson thus: "With regard," asked Mr. Joy, "to all those er—hypothetical questions of my learned friend, they have been all put on the er—supposition of going 12 miles an hour; now that is not the rate at which, I believe, any of the engines, of which *you* have spoken, have traveled?" "No," replied George, "except as an experiment for a short distance". —"But what they have gone has been three, five or six miles an hour?" "Yes".—"So that those er—t h o s e *hypothetical* cases of 12 miles an hour do not fall within your general experience?" —"They do not."

This memorable contest extended over two months and the Bill was finally defeated, to George's profound mortification and sorrow, for he thought that he had vitiated his own case.

But the Directors were not defeated. New plans were deposited and a new Bill. The opposition was much weaker and the Bill was finally carried on the third reading by a majority of 88 to 41. It then passed the Lords almost unanimously. The cost of obtaining the Act amounted to the sum of £27,000.

Stephenson's Ability as a Civil Engineer

George Stephenson was then appointed chief engineer at a salary of £1,000 per annum and he at once entered on his duties, working day and night.

Chat Moss is a peat bog, about 12 square miles in extent. Leading engineers of Stephenson's day declared that no man in his senses would undertake to build a railway across this vast mass of spongy vegetable pulp, that was incapable of supporting the weight of a man. When drains were cut along each side of the proposed line of railway, the soft pulpy stuff flowed back and refilled them as fast as they were cut.

George then set out to achieve the impossible. His idea was to float a railway on this semi-fluid surface by laying down cross sleepers upon a matting of heath and branches of willow and other trees. In the softest places, gates or hurdles interwoven with heather were laid in double thicknesses, their ends overlapping each other; and on this floating bed a thickness of gravel was

spread on which cross ties and rails were laid in the usual manner. In places where there was an excess of water, a few yards of trench were dug at a time, tar barrels were laid down end to end, fastened tightly together and covered with clay, forming underground drains. In some parts, incessant filling had to be done before any indication of a firm road bed appeared.

The directors and everybody else, except George, then lost hope. But he kept saying, *"You must go on filling; there is no other help for it."* The rest of the line included cuttings, embankments, tunnels and bridges, all of which were planned and carried out under the supervision of George Stephenson. Double sets of laborers were employed, the night shift working by torch and firelight. The road (single track) across Chat Moss was then finished January 1, 1830, and was double tracked shortly afterwards. It has been in constant use from that day to the present.

In the midst of all this, locomotive engines had to be designed and built, and we come now to the period when Robert Stephenson became a valuable assistant to his father. George had given his son a good education and Robert took charge of his father's interest in the R. Stephenson & Co. works at Newcastle, where from that time he was mainly responsible for the locomotive developments introduced by this firm.*

Against the opposition of the fixed engine party, the directors of the railway decided to offer a prize of £500 for the best locomotive engine. Among the stipulations were that the engine should consume its own smoke and, if of six tons maximum weight, had to draw 20 tons, including the tender, at 10 miles an hour, with a boiler pressure not exceeding 50 lb. per square inch, the engine and tender to be supported on springs and the company to be at liberty to test the boiler to 150 lb. per square inch.

Preparation for the Rainhill Trials

Robert was in constant communication with his father and between them an entirely new locomotive was designed. At the suggestion of Henry Booth, secretary of the railway, a multitubular boiler was decided on. Booth was, doubtless, unaware of what had been done by Stevens, Neville and Seguin. The engine was built at the Newcastle Works and named "Rocket". The boiler was 6 ft. long by 3 ft. 4 in. in diameter, containing 25 copper tubes 3 in. in diameter. The inside firebox was of copper, 2 ft. long by 3 ft. wide by 3 ft. deep, with a water space of 3 in. around it. It was separate from the boiler and attached to the back thereof by rivets. Circulating pipes connected it to the boiler. The chimney base was enlarged to cover the ends of the tubes. The driving wheels were 4 ft. 8½ in. diameter. Total heating surface was 137¾ sq. ft. The cylinders were 8 in. diameter by 16½ in. stroke, attached to a plate frame fastened to the boiler at an angle of about 35 deg., but the main frame was of the bar type, 4 in. by 1 in. Mr. Ahrons says that Robert originated the plate frame for a locomotive built in 1828.

This plate frame being fastened to the boiler was faulty because it did not give firm connection between the cylinders and driving wheels. For this reason, and the steep inclination of the cylinders, the engine was unsteady at high speeds.

The exhaust steam was led by two copper pipes to the chimney, one on each side. A feed pump was worked from the crosshead. The weight of the engine in working order was 4 tons 5 cwt. and of the tender 3 tons 4 cwt. The driving wheels were of wood with iron tires.

Other engines were entered for the competition, but they were all eliminated except Hackworth's "Sanspareil" and Braithwaite and Ericsson's "Novelty." They both broke down from failure of the machinery and defects of design. They never could have made high speed locomotives.

The trials of the Rocket commenced at Rainhill on a piece of level track, October 8, 1829. Two loaded cars were attached to it, making the whole moving weight 17 tons. The fastest run was at the rate of 24 miles an hour. When running light, without the tender it ran at the rate of 29½ miles an hour; and a car containing 36 passengers was drawn at the rate of 28 miles an hour. The trials were finished on October 14, 1829, and the directors awarded the prize of £500 to the Messrs. Stephenson and Booth.

To show that the Rocket was capable of higher speeds, George ordered it to be brought out without the tender and then drove it over a course of about four miles at the rate of 35 miles an hour.

One of the drawings shows the Rocket as it ran at Rainhill. This drawing was made by G. H. Phipps, M.I.C.E., a draftsman employed by the Stephensons; but he made it partly from memory and omitted some details, lately discovered. It was published in The Engineer of 1884. In Engineering of the same year, an eye witness states that at the end of October, 1829, the Rocket was derailed, smashing the chimney base and front framing. When repaired, she had a regular smoke box and a shorter chimney. Again, at some unknown period, the cylinder frames were lowered to an angle of 8 deg. and fastened to the bar frame. The engine then ran steadier at high speeds. We do not know who originated these great improvements. The engine afterwards drew a light train upwards of four miles in 4½ min. It did a variety of service and was then placed in the Science Museum, London.

Between the date of the Rainhill trials and the public opening of the railway, the Stephensons had turned out eight engines of improved design. One of them, the "Northumbrian," had nearly horizontal cylinders and a firebox raised some inches above the top of the boiler, as shown in one of the illustrations, which is a reproduction of a contemporary engraving. This engine headed a procession of trains at the opening of the railway on September 15, 1830 and the ceremony was regarded as an important national event, the Duke of Wellington, then Prime Minister, and Sir Robert Peel, secretary of state, being present.

The company expected to earn £10,000 a year from passenger traffic. The first year's receipts were £101,-829. Freight was expected to give £50,000. It gave £80,000, and the commercial success of railways was demonstrated without the shadow of a doubt.

The Rocket

The Rocket had the bar frame, subsequently adopted in America. The plate frame for the cylinders was the beginning of British practice. The multitubular boiler with a separate firebox, which was quickly changed to the regular Stephenson firebox as in the Northumbrian, has been universally adopted and was the origin of the American wagon-top boiler.

The Rocket combined in itself all the essential features of the modern locomotive and was the most remarkable steam engine ever constructed.

It may be added that an engine named "Planet," built immediately after the Northumbrian, had the driving wheels at the firebox end and horizontal cylinders in the

* The British Steam Railway Locomotive from 1825 to 1924, by E. L. Ahrons, M.I.M.E., London, 1925.

smoke box. The bar frame was abandoned and a solid horizontal plate frame substituted. This is British practice of today.

It may not be generally known that some time ago Henry Ford ordered from Messrs. Robert Stephenson & Co., Ltd., the original builders of the Rocket, a replica of the old engine of 1829. He gave the firm a carte blanche order to build an exact duplicate, capable of running under its own steam. It has cost a lot of money, but for that Mr. Ford cares nothing. The engine will be placed in his Detroit museum.

In The Engineer, issue of May 31, 1929, will be found an interesting article giving a full account of this replica, copiously illustrated.

When Messrs. Stephenson & Co. received the order they made a thorough search among their drawings and records and turned up some details of construction never before published. Among them was the complicated valve gear. This gear was a hook motion, but British engineers call it a "gab" motion. We quote from the article as follows:

"Reversing is a tricky business. The gab rods have to be lifted off their pins, a pedal has to be pressed, and the gabs have to be dropped again upon their pins, all in proper sequence. The Rocket had, let us say 'has,' for she lives again in her new incarnation, but two eccentrics, one for each cylinder. These two eccentrics are fixed firmly on a sleeve in the right relative position to each other. On each side of them, keyed to the shaft, is a dog clutch. By pressing the foot on a pedal," (not shown in Phipp's drawing, Fig. 1) "kept up by a U-shaped spring, the sleeve can be moved out of engagement with both these clutches. In this position, after releasing the gabs, the driver takes the two valve levers in his hands and works them in proper unison, until the engine starts to move in the desired direction. He then drops the gabs into position and either releases the foot lever, so that the sleeve is pushed back by the spring, and the eccentrics lock themselves in one position, which they have automatically taken up, or depresses it till a notch engages with the foot plate, and the eccentrics are fixed in the other position by the other dog.

"At last, through the fine spirit of Mr. Henry Ford and the devotion of the old firm, we know what the Rocket was like at Rainhill."

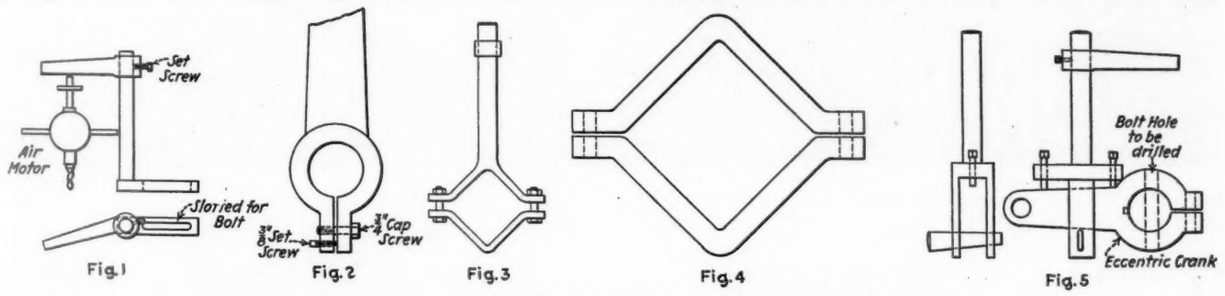
Robert Stephenson's Part in Building the Rocket

There is no doubt but that Robert Stephenson had much to do with designing and building the Rocket. George's energies were almost completely absorbed by the construction of the Liverpool & Manchester Railway, during which time Robert was the leading spirit in the Newcastle Works where he was building the Rocket and stationary engines and machinery for the construction of the railway, consulting his father from time to time by correspondence.

For some of the matter embodied in the present article, the writer is indebted to Smile's "Life of George Stephenson," London 1881.

Modifications of the "Old Man"

THE accompanying illustrations show the familiar types of "old man" and some variations which are not so common but which are time-savers in the back shop or enginehouse. Fig. 1 shows the simplest form, consisting of a base and vertical member made in one piece together with an adjustable arm held in place by a set screw. Fig. 2 shows an improved arm which is split and drawn tight by a ¾-in. cap screw. A small ⅜-in. set screw, when tightened, spreads the split portion and frees the arm. This type of arm is steady, and the upright column is not burred by the set screw. Fig. 3 is the form of "old man" used to clamp onto a locomotive axle or crank pin. It is used to drill holes for shipping keyways in axles or pins.



Modifications of the "old man" to meet special conditions

Fig. 4 is not an "old man," but is a diamond clamp used to back up a motor in drilling holes in the hub of a wheel for the application of hub liners. An extention plate may be welded to one half of the clamp and then the clamp may be used to back up the motor in drilling holes in the rim of engine truck wheels, etc.

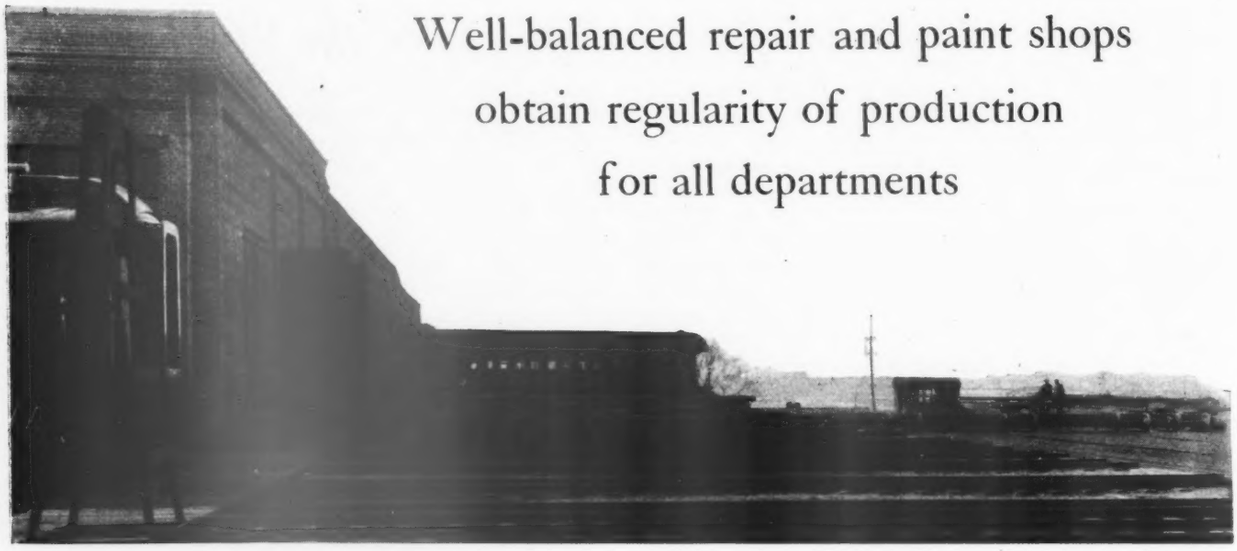
Fig. 5 illustrates a special "old man" used to drill the eccentric crank bolt holes in locomotive main pins. The holes in the crank itself are often drilled on the drill press, but the hole through the pin cannot be accurately located until after the valves are set. As shown, a slotted yoke fits over the web of the crank and a taper key draws it tight. The set screws permit the use of the device on several different classes of cranks, and are adjusted before the taper key is driven.

* * *

Northeastern Railroad of Georgia 4-4-0 type locomotive No. 2 "J. W. Nicholson" built by Baldwin in 1878—14 in. by 24 in. cylinders; 56-in. diameter drivers; 130-lb. boiler pressure; 9,280 lb. tractive force

Maintaining Passenger Cars on the C. of Ga.

Well-balanced repair and paint shops obtain regularity of production for all departments

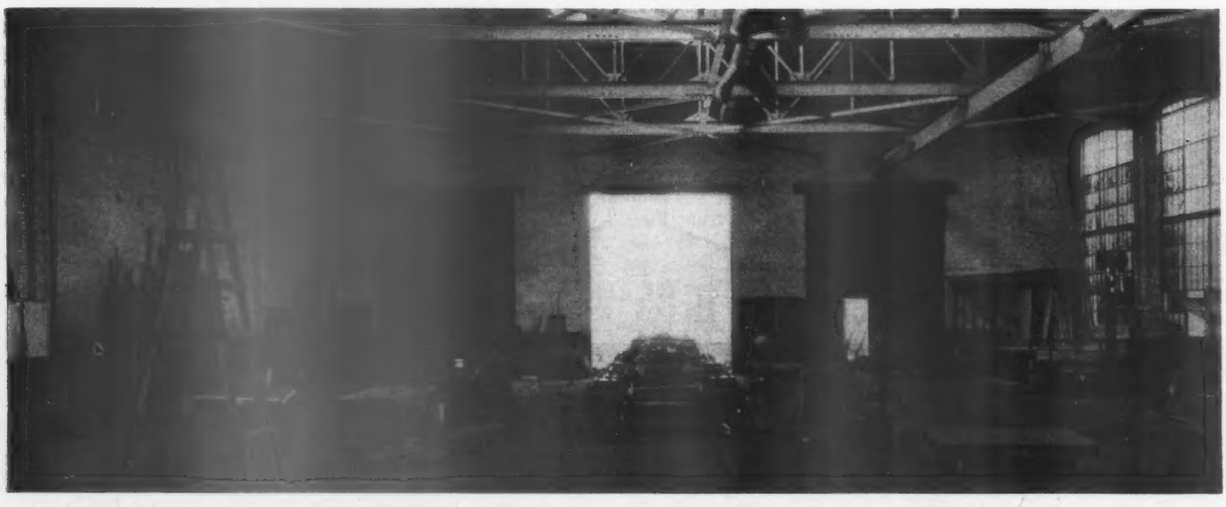


Looking down the front of the coach shop from the stripping tracks

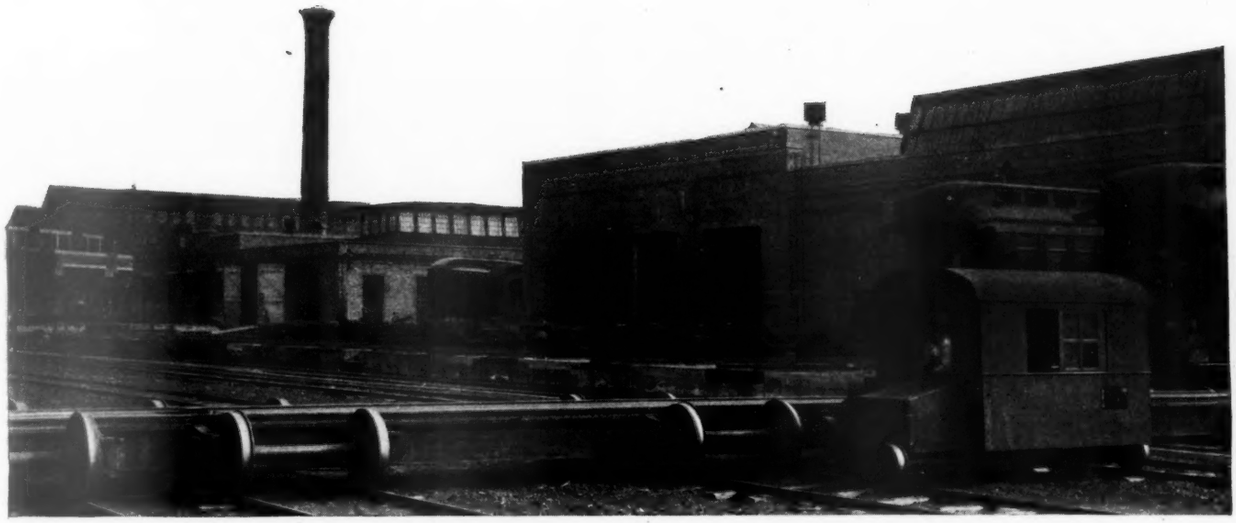
THE Central of Georgia maintains its passenger equipment in a comparatively new shop, which is located within the city limits of Savannah, Ga. This city comprises the eastern terminus of the system, and is one of the most important points on the railroad for the origin of passenger business. The headquarters of the executive, traffic and other departments, including the mechanical, are located in Savannah, which makes the location of the shops not only strategic from the standpoint of passenger business, but also convenient for all departments concerned with the development of or changes in passenger equipment.

The Central of Georgia has been one of the most progressive roads in the south in developing new interior arrangements and decorations and in improving comfort facilities, especially for day-coach service, and has made some striking innovations in the remodeling of many of its day coaches, as well as in special service equipment.

The coach shops at Savannah were built in 1924. The western portion of the ground on which the main shop building is located slopes toward the intersection of West Jones and West Boundary streets which made it possible to place large windows in the walls of the basement floor on two sides of the building. As shown in several of the illustrations, the appearance of the shop from the repair-track area is that of a single-story struc-



The coach repair shop—Trucks are repaired on the track at the extreme right



General view of the coach shops

ture. Actually it is a two-story building which has been well adapted to the efficient handling of passenger car repairs.

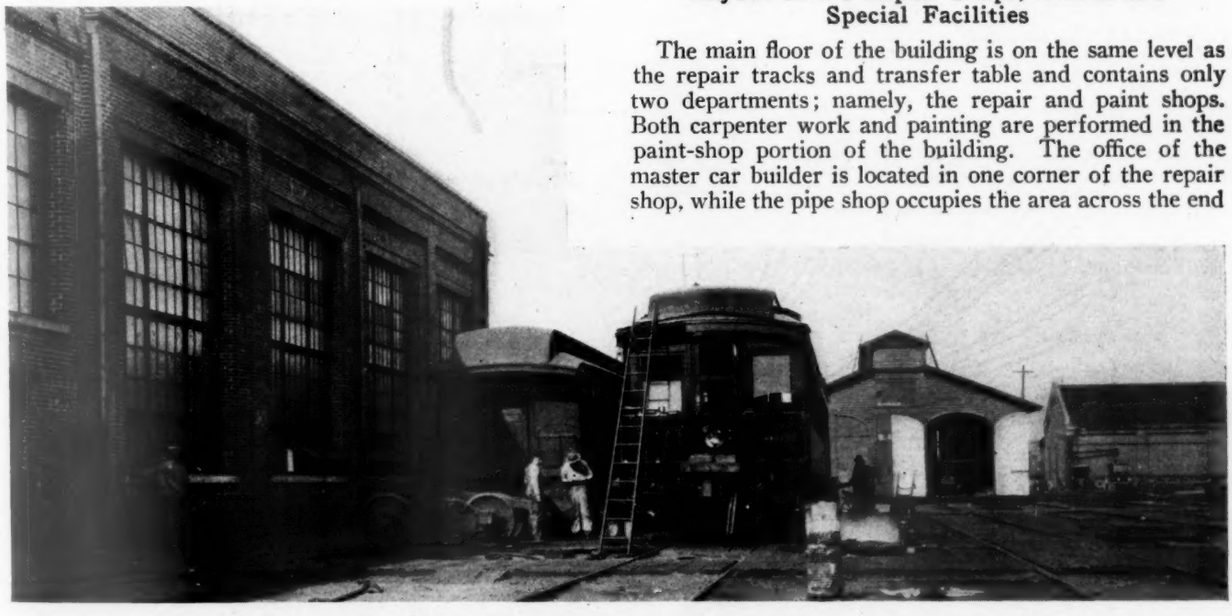
Working Force and Shop Equipment

The Central of Georgia owns and operates 266 passenger cars. It is the policy of the car department to bring wooden equipment into the shop for painting after a period of from 12 to 15 months in service, and steel equipment after 18 to 20 months in service. The average output of the shop for all classes of repairs is 14 cars per month. This production is principally handled by a working force of 72 men, who are supervised by four foremen, making a total force of 76 employees. This force, excluding the supervisors, consists of nine painters, three painter apprentices, nine laborers or helpers, four upholsterers, 27 coach carpenters, four carpenter apprentices, and 16 helpers and laborers. This does not include the tinners, cabinet makers, or electricians, a considerable portion of whose time is devoted to the work of other departments.

The shop building is of brick and steel fire-proof construction. It is well-ventilated by a system of fan blowers and air ducts which permits the use of spray-painting equipment in any part of the paint shop and at the same time keeps the danger from fires at a minimum. A hot-air heating system is used and the building is piped for acetylene throughout. All work attended by dust or bad odor, such as picking, cleaning upholstery, glueing, etc., is performed in well-ventilated rooms located in the basement. These rooms are placed along the inside walls, as shown in one of the drawings, which permits the arranging of the upholstery, electrical, cabinet and tin shops around the outside where natural light through the windows is afforded. The machine tools and equipment used in these shops, and also in the coach repair shop on the main floor, are shown in the table.

Layout of the Repair Shops, Tracks and Special Facilities

The main floor of the building is on the same level as the repair tracks and transfer table and contains only two departments; namely, the repair and paint shops. Both carpenter work and painting are performed in the paint-shop portion of the building. The office of the master car builder is located in one corner of the repair shop, while the pipe shop occupies the area across the end

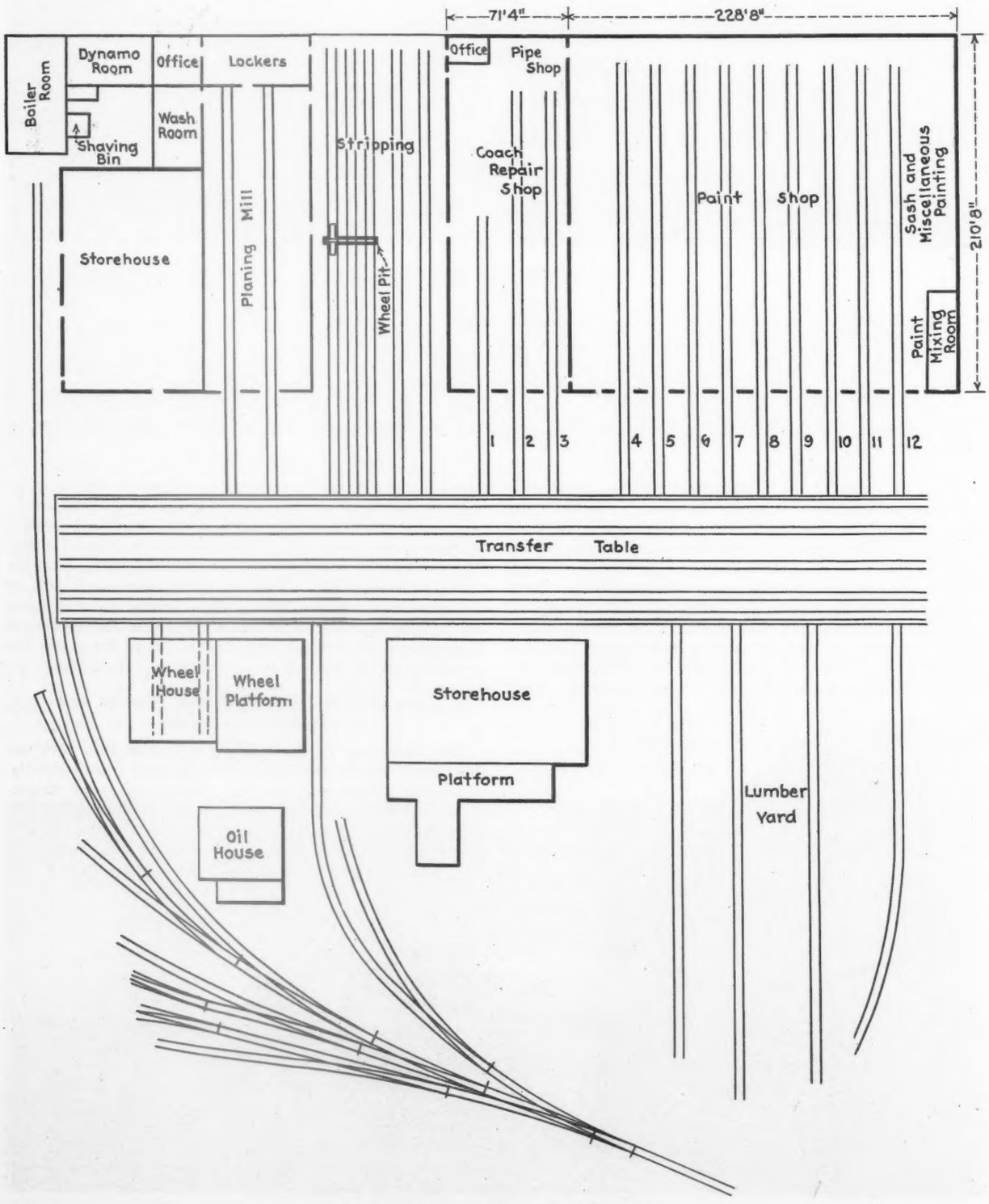


Completing work on a coach on the stripping tracks

of the building between the office and the paint shop.

Three tracks lead into the coach repair shops directly from the transfer table. Track No. 1 is used for truck repairs, while tracks 2 and 3, with a capacity for four coaches, are used for repairs to brakes and brake rigging, draft gears, safety appliances, etc. The truck repair track is provided with an overhead monorail, shown in one of the illustrations, which carries a six-ton capacity Sprague electric hoist. The machine-tools and shop equipment are arranged in the area bounded by track No. 2, the master car builder's office, the outside wall of the building next to the stripping tracks, and the end of track No. 1, which marks the end of the truck-repair area.

The paint shop has a track capacity for 18 coaches. It would appear, considering the comparatively small track capacity of the repair shop, that the track capacity of the



Layout of the shops and repair tracks

paint shop is considerably out of proportion to that of the repair shop. However, in the proportioning of these two shops due allowance was made for the drying time

Doors and sash are painted with other miscellaneous parts and furnishings at one end of the shop—Finished window sash drying in a locker

required between coats of paint and also for the time required for different classes of repairs.

The Central of Georgia has for a number of years, followed the practice of applying only one coat of interior varnish on one coat of paste filler, and two coats of shellac after the old varnish has been removed, and then applying a coat of varnish after each re-washing.

List of Machine Tools and Equipment Used in the Central of Georgia Coach Shop at Savannah, Ga.

No.	Size or Type	Machine
		COACH REPAIR SHOP
1	.....	Forbes pipe cutting and threading machine
1	.....	Clarke metal cutting band saw
1	10-ft.	Niles-Bement-Pond pneumatic flanging clamp
1	.....	Henry Pels punch and shear
1	.....	Hisey-Wolf emery wheel
1	18-in.	Drill press
1	14-in.	U. S. sensitive floor drill
1	.....	Pedrick pipe bending machine
1	Two-point	Electric rivet heater
1	.....	Westinghouse electric welder
1	.....	Metal buffing and polishing lathe
1	Six-ton	Sprague electric hoist
		CABINET SHOP
1	.....	Fox universal wood trimmer
2	.....	Wallace universal bench rip saws
1	.....	Wallace patented band saw
1	.....	Fay & Egan sash and door clamp
2	.....	Wallace bench jointers
		UPHOLSTERING SHOP
2	.....	Singer sewing machines
1	.....	Frank hair picker
1	.....	Motor driven car seat cleaning machine
		SHEET METAL SHOP
1	25-in.	Square shears
1	32-in.	Square shears
1	72-in.	Cornice brake
1	12-in.	Swedging machine
1	36-in.	Hand roller
1	.....	Hand punching machine
1	20-in.	Brake
1	37-in.	Brake
1	34-in.	Spangler machine
1	.....	Small burring machine
1	.....	Wiring machine
		PAINT SHOP
1	No. 117	Binks spray painting equipment

The saving effected by applying only one coat of varnish, and then building up additional coats each time the car comes into the shop for general repairs, is considerable. Many coaches arrive at the shop which require comparatively little work on the part of the repair shop and in some instances, none at all. As a rule, the repair shop can complete its quota of work on a coach in much shorter time than the paint shop. Therefore, this proportioning of track capacity between the repair and paint shops is not out of line, as coaches are often routed directly from the stripping tracks to the paint shop, and also frequently taken directly from service into the paint shop.

Consideration should also be given to the fact that the carpenters working on car bodies also use the tracks in the paint shop. By careful planning of the work, together with the advantages afforded by the layout of the shop itself, there is always a sufficient number of cars in the paint shop to enable the carpenters to work some distance away from coaches which the painters are varnishing.

The upholstering, electrical, tin and cabinet shops are located in the basement. The glue, picking, paint-storage, and drying and cleaning rooms are also located in the basement, as shown in one of the drawings. Materials are handled to and from the basement by two five-ton elevators having a platform 6 ft. wide by 12 ft. long. One elevator is located in one corner of the upholstering shop, while the other is located at one side of the tin shop. Broad stairways with wide steps and easy risers are located near each elevator.

Separate lavatories for white and colored employees are located at one end of the tin shop. These lavatories are provided with sheet-metal lockers and modern toilet facilities. The stationery and multigraphing department shown on the basement floor plan is under the jurisdic-

Interior view of the paint shop showing the scaffolding

tion of the stores department and has no connection with the operation of the coach repair shop.

The Paint-Shop Scaffolding

A feature of the paint shop equipment is the scaffolding, the construction of which is shown in one of the drawings. The upper steel framework is made of 2-in. by 2-in. by ¼-in. angles, fastened at the top to the bottom members of the roof truss. The scaffold boards are reinforced underneath by a 2-in. by 4-in. plank, which is bolted to the scaffold board by ½-in. carriage bolts. The scaffold boards are carried on cast iron brackets provided with lugs which extend over the edges of the supporting columns and serve as guides. The columns are made of two 3-in., 5-lb. channels placed back to back,

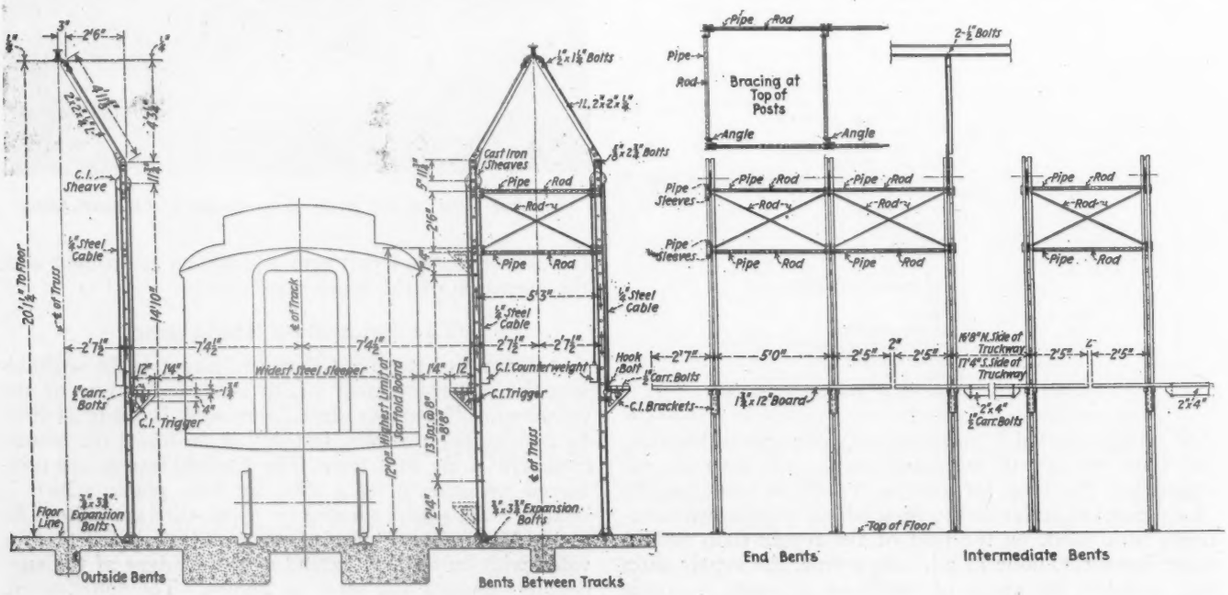
View in the basement looking through the cabinet shop toward the tin shop

with a space of one inch between to permit free operation of a trigger, which is pinned to the bracket. The trigger is of cast iron and is cast with a counterweight which throws it to a horizontal position when released. Cast iron counterweights, attached to the scaffold by a ¼-in. steel cable, facilitate the raising and lowering operations. The action of the trigger does not interfere with the raising of the scaffold, but it must be held clear of the column trigger pins when the scaffold is lowered. Twelve feet is the extreme limit that the scaffold boards may be raised.

System of Operation

Incoming coaches for class and heavy running repairs are brought directly to the stripping tracks where the car bodies are jacked-up, the trucks removed, and the bodies placed on shop trucks. A wheel pit for changing wheels extends under the three stripping tracks. Repaired wheels ready for application are stored in the wheel house from which they can be rolled directly onto the transfer table and thence to the stripping tracks. Wheels to be turned or scrapped are taken from the wheel pit via the transfer table to the wheel platform. The storehouse is located between the planing mill and a 35-stall enginehouse which is not shown in the drawing. This storehouse carries supplies and materials for both the coach and locomotive departments, but is conveniently located for the efficient handling of materials to all departments in the coach shop. Materials for the coach shop are also carried in stock in the storehouse which is located directly across the transfer table from the coach repair shop.

All the upholstering and trim are removed while the car is on the stripping tracks, and moved by electric or hand truck directly to the basement. Trucks are moved to track No. 1 in the repair shop where they are overhauled. After the work of stripping has been completed, the foreman inspects the car and indicates what is to be



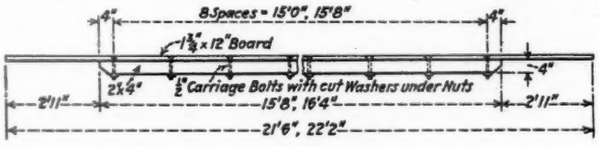
Details of the scaffolding construction

renewed, scrapped, etc. This inspection also indicates what route the car is to follow through the shop. Each car is moved through the shop on shop trucks, until the repairs to the body and trucks are completed. Cars are trimmed, after which they are moved out onto the stripping tracks, where the trucks and upholstering are applied.

The Paint Shop

The larger portion of the coach equipment is finished with wood, both exterior and interior, Mexican mahogany being used for the interior finish on the majority of passenger coaches. Coaches having an interior finish of Mexican mahogany are first cleaned off with varnish remover and then sponged with alcohol or benzine. The interior wood work is then sanded, which operation is followed by a thin coat of paste filler. Two coats of thin shellac are then applied.

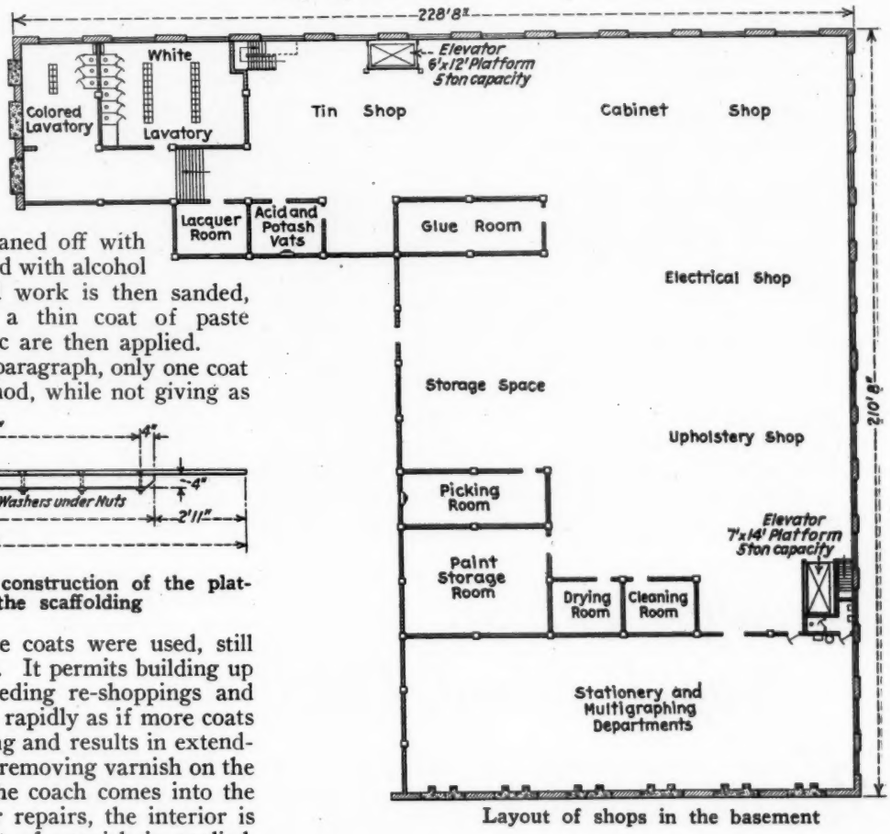
As pointed out in a preceding paragraph, only one coat of varnish is applied. This method, while not giving as high a gloss as if two or more coats were used, still presents a very good appearance. It permits building up with additional coats on succeeding re-shoppings and does not overload the surface as rapidly as if more coats were applied on the first handling and results in extending the period of time for again removing varnish on the interior. For example, when the coach comes into the shop 15 or 18 months later for repairs, the interior is washed down and another coat of varnish is applied. This operation may be repeated for several shoppings without again removing the varnish from the interior of car.



Drawing showing the reinforced construction of the platform boards used on the scaffolding

Headlinings are washed and given one or two coats of long oil enamel, as may be deemed necessary. A good quality of enamel is used, and as a result the job presents a very good appearance for six or seven years with an occasional washing.

The exteriors of wood-sheathed cars are burnt off with a torch which is supplied with a mixture of city gas and compressed air. The carpenters then perform the necessary repairs, ease down the joints and sand the car with No. 2 sandpaper. A priming coat of No. 1 surfacer is then applied which is followed by a coat of regular surfacer and then a coat of sanding surfacer. The car is then puttied and any rough surfaces are glazed over, after which the entire exterior surface is sanded down with



Layout of shops in the basement

Looking through the upholstering shop toward the cabinet shop

half-emery paper. The car then receives one coat of color which is sprayed on. It is then lettered in gold, after which two coats of finishing varnish are applied by means of a spray.

Usually one coat of a good quality of roof paint is applied on the roof while the trucks, platforms, vestibules, and underframe are sprayed with one coat of truck enamel.

Coaches with steel exteriors receive the same treatment in the paint shop as coaches having wood exteriors, except that one additional coat of surfacer is applied. Forty-eight hours drying time is allowed for primer and varnish coats, and 24 hours for all other coats.

A simple yet effective device is used in the paint shop, when spray-painting the exteriors of coaches, to prevent paint entering the interior of the car or adhering to the window frames. It is a collapsible screen made in two sections, 36 in. high by 18 in. wide, which are fitted together so as to operate in a manner similar to that of cloth covered ventilators or collapsible fly screens which are commonly used in dwelling houses; however, the screens are made of galvanized iron and can be fitted in any car window having an extreme width between the side window fits of 32-in. The top and bottom members of one section are grooved to fit tongues on the outer edges of the top and bottom members of the other section. Sufficient over-lap between the two sections of the screen is allowed to prevent any possibility of paint entering the car.

Cleaning Threads on Washout Plugs

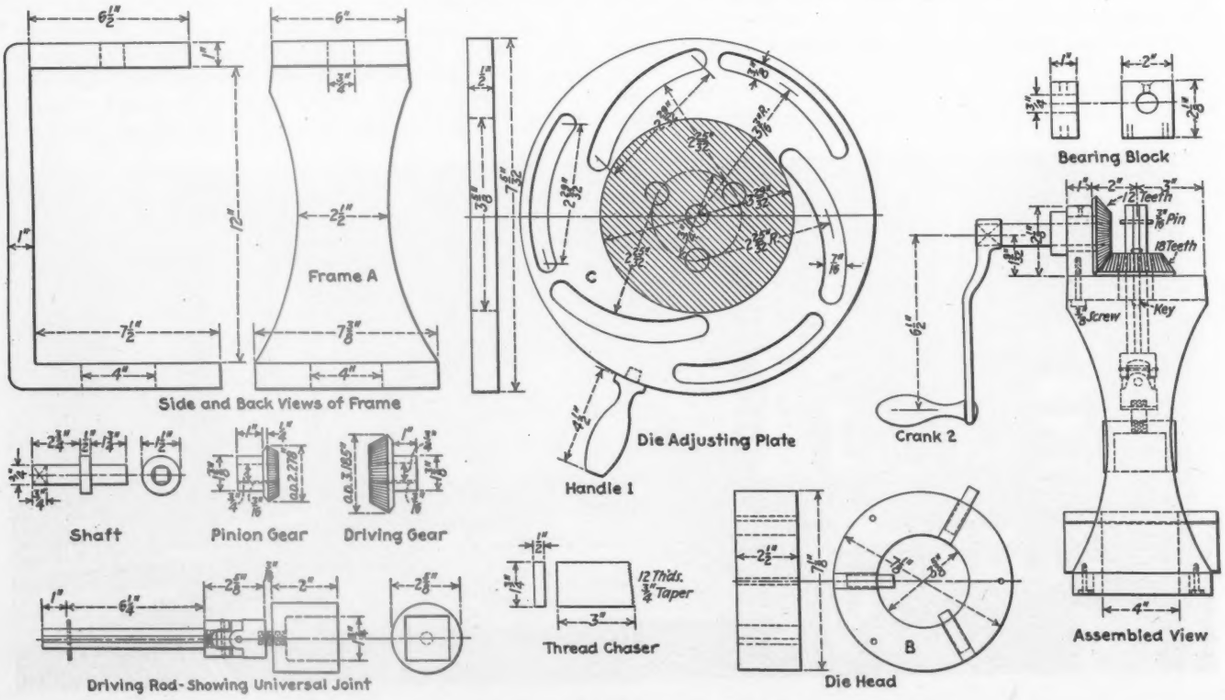
WHERE locomotive boilers are equipped with a number of brass washout plugs they are usually threaded 12 threads per inch, with a taper of ¾ in. in 12. It is important that these plugs be maintained steam tight, which means that the threads must be in good condition. Each time the boiler is washed out, all plugs must be removed, inspected and cleaned.

Various methods are employed for cleaning the threads on these plugs, but the device shown in the accompanying illustration does this work in a very efficient manner. The device consists of a frame *A*, a die holder *B*, and a die adjusting plate *C* as the principal parts. To use the device the plugs are inserted in the socket attached to the driving rod by a universal joint. The plug is entered in the die holder, the dies of which are adjusted by the use of the handle *1* attached to the die-adjusting plate. After the dies have been adjusted to take the size of plug needed, the plug is run into the die by turning the crank *2*. About one minute is required to re-chase or clean the threads on the ordinary washout plug.

For convenience the device can be mounted on a small two-wheeled truck and placed near the locomotive from which the plugs are to be removed. The dies used in the device have the taper ground on them, with the result that all plugs run through them will have the correct taper. Many plugs that would otherwise be thrown away can be reclaimed and used again by being run through this device.

The illustration also shows the method used in laying out the die adjusting place *C*. A disc is pressed in the die adjusting plate and all centers are located on this disc as shown. After the machining operations have been completed the disc is then removed. The shaded portion of the die adjuster is not cut out until after the slots have been milled out. Roller bearings are fitted in the slots.

GRINDING WHEELS.—The factors which have to be considered in the selection of grinding wheels and the relative importance of each are described in the 24-page booklet, entitled "Factors Affecting Grinding Wheel Selection," which has been issued by the Norton Company, Worcester, Mass.



Construction of a device for cleaning the threads of washout plugs

Remanufacturing unserviceable superheater units at the East Chicago plant of the Superheater Company

Superheater Units Reconditioned

Remanufacturing service at the plants of the Superheater Company makes worn units practically like new

THE value of the superheater in American locomotive practice has for a number of years been so well established as to require no further demonstration. And yet, maximum returns from the investment in superheater equipment cannot be realized unless the units are maintained tight against leaks, of the proper length and diameter, to provide a minimum restriction to steam flow through the units and to the flow of gas through the flues.

Experience has shown a very satisfactory service life for superheater units, in all types of locomotives under a wide range of operating conditions, where reasonable care has been exercised in handling and maintenance. In some cases, superheater unit tubing shows no appreciable deterioration after 15 years of hard service; however, the average effective life under normal service has been found to be about 10 years. Occasionally a careful examination of units shows corrosion of the tubing which apparently could only have been caused by exposure to the weather, or improper storage of the locomotive. Whatever may be the cause, when superheater units become unserviceable, a railroad is faced with two alternatives, namely, to make temporary and more or less makeshift repairs which in the long run prove uneconomical, or to have the units overhauled and completely reconditioned, pro-

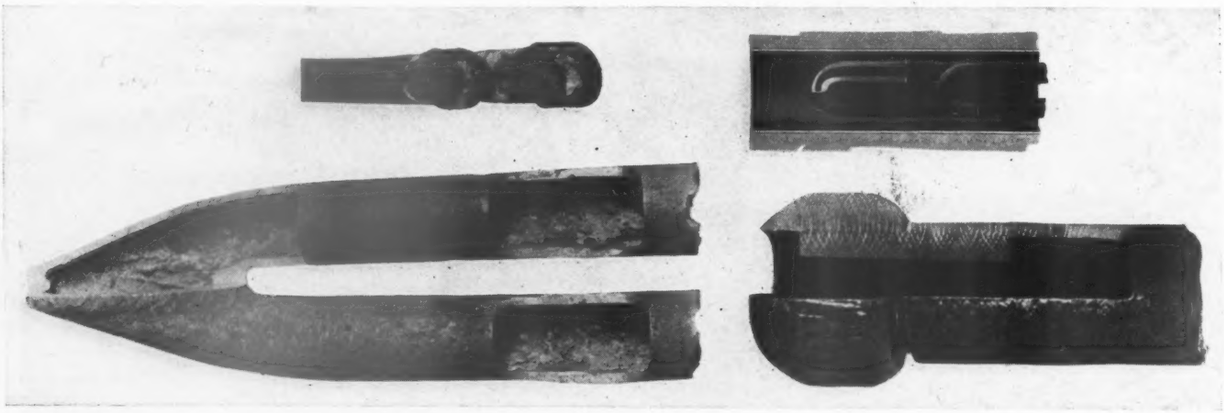
Steps in the manufacturing process of the return bend—Right to left: Two tubes to be forged together, breeches piece, preliminary swagging, final closing, flattening and finishing

viding a subsequent life practically the same as new.

Railroads are not in a position to recondition superheater units with entire satisfaction for themselves, because regular railway shop machinery does not contain the special equipment required, nor the volume of work to justify investment in the special machinery.

With its specialized experience, carefully developed equipment and methods in manufacturing new superheater units, The Superheater Company and The Superheater Co., Ltd., are fitted to provide the railroads with an efficient remanufacturing service at their respective plants in East Chicago, Ind., and Sherbrooke, Que.

Several thousand sets of units, received from railroads throughout the United States, Canada and Cuba, at these plants during the past twelve months, were stripped, obsolete and defective return bends and ball ends cut off, new tubes applied where necessary, new return bends and ball ends machine-forged integral with the tubing, the units restored to their original length, tested, rebanded, ball ends ground, blocked, painted and shipped back to the railroads, tagged by locomotive classifications ready to go directly into their stores. In fact, these units moved through the same schedule of operations as new units, being in a real sense of the word "remanufactured," and possessing practically the same potential service life as new units. Their similarity in appearance to new units is such that railroad managements have requested that their manufactured units be painted red as a means of identification from new units which are painted black, and this is now standard practice.



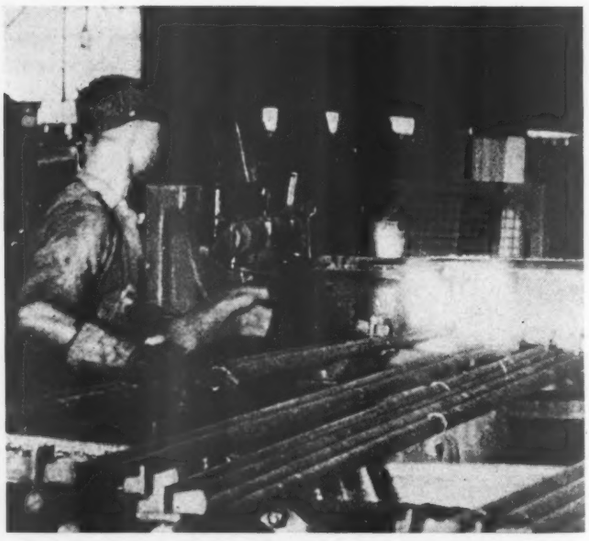
Typical examples of expensive departures from standard su perheater unit design

Pipe ends being heated preparatory to upsetting ends for ball ends

Method of Remanufacturing

Unserviceable superheater units, received at the plants of The Superheater Company for remanufacturing, are unloaded by crane on a stock pile, adjacent to which is a classifying bench with a graduated channel-iron upright for readily checking dimensions and identifying the class of unit. An inspector at this bench, hammer tests each unit carefully, inspects the return bends, ball ends and pipe, and classifies each unit as to the kind of service necessary. A special metal tag is then wired to each unit designating the class of service, class of locomotive and name of road.

Class A service calls for no new tubing. But the return bends are reforged. In the case of Class B service, only the two straight or shorter pipes are reused, the long bent pipes being removed and all return bends and ball ends also renewed. Both classes of service



Ends of unit pipes being heated preparatory to the forging process by which pipes are joined together by forged return bends

include applying new bands and supports; facing, grinding and blocking the ball ends; and furnishing one new heat-treated bolt, washer and nut with each unit.

The first operation following inspection consists of cutting the bands on each unit with heavy hand shears and shearing off the return bends and ball ends on a small power-operated machine with V-knife which removes the ends without flattening the tubing. Faulty return bends, resulting from attempts to repair with facilities at hand in the railroad shops, frequently are found enlarged 10 per cent in outside diameter and with a 25-per cent reduction in steam carrying capacity, reducing the efficiency of the superheater correspondingly and indicating a serious lack of appreciation of the necessity for maintaining original superheater unit dimensions. After shearing, the good tubing is straightened carefully on a long straight metal table, a wooden maul of large dimensions being used to avoid denting the tubing. The tubing is then ready for the forge shop.

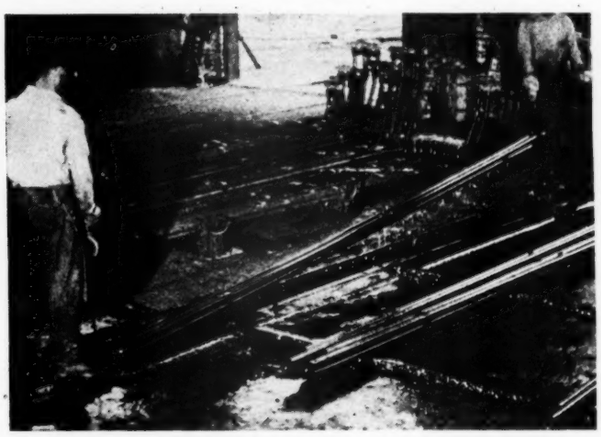
All unit tubing must be straight and true to gage before going to the forge shop. Man straightening a length of pipe with a wooden maul

Every unit is given a 1,000-lb. hydrostatic test

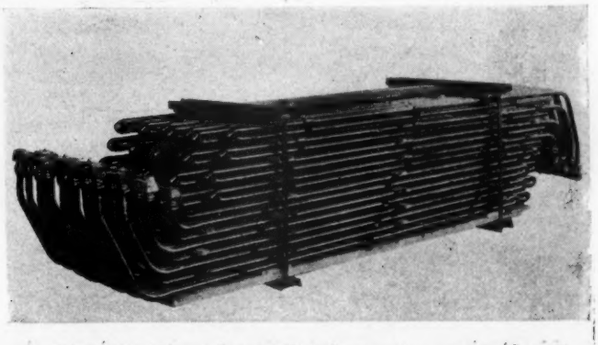
The first operation in the forge shop consists of forming the ball ends which is done by upsetting, a three-operation die being used in this process to prevent "cold-shut" creasing of the pipe. The tubing with ball ends are then bent cold in a special machine which performs this operation without denting the pipe or reducing the full cross-sectional area. The pipes are offset a proper amount in the same type of machine, and then are assembled for the forging of return bends. Temporary key clamps placed on the pipes keep them in the correct position during the forging operations.

Forging Operations Carefully Controlled and Checked

A battery of special machines performs successive operations in forging the return bends, this being a machine-forging job throughout. In the initial operation, the breeches piece is formed in one operation. A preliminary swagging operation follows and then the final closing of the weld with two subsequent flattening and finishing operations. A total of five forging operations is thus required with three heats to forge each return bend completely. This form of return bend gives a construction stronger than the original metal and presents a minimum obstruction to the flow of the gases. The greatest care is exercised in controlling the forging machine operations, test return bends being cut open after each die change and, at least, twice daily to make sure that the proper wall thickness is maintained. The cross-sectional area is also checked by means of a planimeter.



Painting units before shipment—Remanufactured units are painted red to distinguish them from new units which are painted black



A complete set of remanufactured units ready to ship

Following the forging operations, each unit is given a 1,000 lb. hydrostatic test which shows up any defect quickly. The bands and supports are then placed on

the unit to hold the tubes tightly together, prevent vibration and keep the unit at the proper location in the flue. A spot weld on either side of the support maintains its correct position on the unit. When the units have been completely assembled, the ball ends are carefully ground, having been previously reamed and filed to remove any burrs. Special tools and gages that are hardened and kept ground to precision assure a correct contour on the unit joint. Wooden blocks filled with grease are then bolted in place over the ball ends to protect the ground surfaces. Before shipping, the units are dipped in a red paint bath for protection.

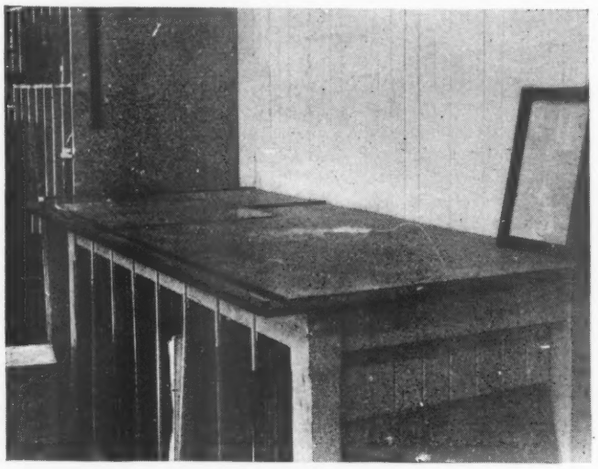
Headers and Alloy Steel Bolts Receive Especial Attention

An entire department at the East Chicago Plant is devoted to the question of superheater headers. These headers, poured from a mixture of high-grade pig iron and steel scrap, are designed to have the close-grained, uniform softness and smooth texture of the best grey iron. The machine shop is provided with the latest equipment for the rapid and accurate machining of these headers. Unit ball end seats in the header are finished and tested with the same precise methods described in connection with making the ball ends.

A special department is also maintained for the manufacture of the bolts and nuts, with which the units are held in place against the header. To prevent the stretching of the unit clamp bolts and consequent leaking of the joints at the header, all bolts are made of alloy steel, specially heat-treated. These bolts, as determined by frequent tests in the laboratory testing machines, develop a tensile strength in excess of 100,000 lb. per sq. in. and an elastic limit of 75,000 lb. per sq. in. These bolts, in connection with special nuts, are designed to provide the necessary physical qualities for permanently holding the units tight against the header under widely varying temperature conditions encountered in the smoke-box.

Table for Window Glass Repairs

THE bench shown in the illustration is used for cutting and storing glass. It is 6 ft. long by 3 ft. wide and has a groove mortised in the top near the edge, in which the large T-square for marking off the glass is slid back and forth across the table. The front



Convenient table on which to handle glass for passenger coaches

metal edge of the table is laid off as a ruler in ¼-in. divisions for use as a measuring stick. Compartments 8 in. wide beneath the table, and others in the form of a shelf located along side of one end of the table are used to store panes of glass to prevent breakage.

Right—Proper instructions for packing journal boxes have been an important factor toward solving the hot box problem Left—Journal box packed according to A.R.A. requirements

Car Officers Discuss Billing and Interchange Rules

Concluding sessions of Chicago convention notable for active interest in these vital subjects

AT the Master Car Builders' and Supervisors' Association convention, held at Chicago, September 4 to 6, inclusive, as reported on page 607 of the October *Railway Mechanical Engineer*, the program was notable for the variety of subjects presented as well as the keen interest and active discussion. Most of the important phases of car department work were at least touched on during the course of the convention, which brought together some of the ablest and most experienced car men in the country. The concluding sessions were devoted largely to a discussion of American Railway Association loading, billing and interchange rules which have such an important bearing not only on car department operation but on the efficiency of the railways as a whole. The reports and discussion which follow are indicative merely of the thought and opinion of experienced and practical railway officers on the M. C. B. & S. committees. They are not official expressions or rulings from the American Railway Association Arbitration Committee.

Report on A. R. A. Billing

During the past year the following questions have been submitted to the committee for their consideration and the committee submits for your approval the following answers.

Q. 1—Is a charge permissible for cleaning a triple or control valve and cylinder on passenger equipment within the nine-month period even though only one part is defective?

A.—No.

Q. 2—With reference to note following Rule 105 from what source should billing department receive information as to whether an item of repairs is a manufactured article not subject to competitive prices and which can only be obtained from one manufacturer or concern?

A.—From purchasing department.

Q. 3—In case of a cut journal, handling line responsible, where one or both wheels are found to be loose and new wheels are applied, is the repairing line justified in rendering a material charge for such new wneels less credit for the loose wheel or wheels removed, it being understood that a loose wheel is considered as a second hand wheel and so credited?

A.—No.

Q. 4—What material and labor charge should be rendered for the renewing of a dust guard, owner's defect, when not in connection with any other repairs which would require the removing and replacing of the journal box? Item 222-A provides for a labor charge for the renewing of the dust guard only when in connection with wheel renewal.

A.—None.

Q. 5—Are car owners justified in refusing to accept charges for the renewing of running board on tank cars when renewed on account of being broken or split when car bore no evidence of, or there is no record of having been damaged by any A. R. A. Rule 32 condition?

A.—No.

Q. 6—Where dome covers are bought in blank, that are not properly threaded to apply to car, can repairing road charge car owner for the cost of machining such covers in addition to the invoice cost, or does the labor of 1.2 hours as allowed by Item 95 to Rule 107 cover such additional work?

A.—These dome covers are castings that require machining and may therefore be charged at net store department cost. See Interpretation 5 to Rule 105.

Q. 7—With reference to decision of Arbitration Case 1360, is a repairing line justified when applying center sill splices, in renewing all floor boards over such splices, or should charge be confined to the amount allowed for the renewing of a small amount of floor boards only, when in connection with such repairs?

A.—Charge should be confined to the actual number of floor boards necessarily damaged in the R. & R. of sills or splice renewals.

This concludes the questions submitted to the committee.

Changes Recommended in Freight-Car Rules

Your committee submits the following recommendations for your consideration:

Rule 33—We recommend that the following note be added to this rule: "When a tank-car running board is

split or broken from any cause other than Rule 32 condition, the original record and repair card must qualify these terms."

Reason—To eliminate disputes as to whether such repairs are owner's or handling line defects.

Rule 98—Recommended Change, Sec. (b) Par. 2—In the case of cut journal, where one or both wheels are condemned account owner's defect, charge against car owner shall be confined to net value of the wheels. In such case if one wheel is condemned account owner's defect and mate wheel is condemned by remount gage, per Rule 82, renewal of both wheels shall be made at expense of car owner.

Reason—To provide for bill against car owner when second hand wheels are applied. The present rule provides for a bill against the car owner only when new wheels are applied. The axle question is fully covered in Rule 86 and is only a repetition in Rule 98.

Rule 101—We recommend that a note be inserted under Item 157-A as follows: "Above prices for door renewals do not include R. & R. of fixtures not fastened to door, but necessarily R. & R. to apply door."

Reason—To clarify these items.

2. We recommend that a table showing weights per foot of various size chain be inserted in Rule 101.

Reason—To eliminate questions on charges for this material.

Rule 107—Recommended Change in Item 222A—Journal box dust guard renewed in connection with *wheels, journal boxes or unit side frames removed* (not to be allowed when journal box *or unit side frame* is renewed) 0.2 hour.

Reason—To clarify the intent of this item and bring it in harmony with Section B of Rule 66, which reads in part: "Dust guards shall be renewed when necessary, only where wheels, journal boxes or unit side frames are removed."

2. We recommend that individual items in Rule 107 applied on a rivet basis allow a charge for jacking car where necessary.

Reason—It is necessary to jack car in many cases to apply rivets and repairing road should be paid for doing such work.

Passenger Rules

Rule 21—We recommend that individual prices be inserted in Rule 21 covering cleaning, oiling, and testing of: Retaining Valves, Dirt Collectors, and Slack Adjusters.

Reason—To clarify and provide charges for this work.

Rule 22—We recommend that prices for extra heavy wrought iron nipples and fittings be inserted for sizes not already covered in this rule.

Reason—To clarify and provide charges for application of this material.

The answers to the above questions and the proposed recommendations for changes in the rules are the opinions of your committee and are not mandatory unless approved by the American Railway Association and incorporated in the rules.

The report was signed by E. S. Swift (chairman), chief A. R. A. clerk, Wabash; F. A. Eyman, chief clerk to superintendent of motive power, Elgin, Joliet & Eastern; B. F. Jamison, special traveling auditor, Southern; W. R. Robinson, A. R. A. inspector, New York, Chicago & St, Louis; H. A. Sigwart, superintendent of car repair bills, Missouri Pacific; L. L. Osborne, chief A. R. A. clerk, Illinois Central; W. S. Anderson, A. R. A. accountant, Chicago & Alton; C. C. Hennessy, head A. R. A. clerk, Big Four; J. G. Raushenberger, maintenance of equipment accountant, Chicago & Eastern Illinois; C. J. Hayes, traveling master car builder inspector, New York Central; E. C. Goetemann, chief clerk, mechanical department, American Refrigerator Transit Company.

Discussion

President S. O. Taylor (M. P.): This billing correspondence is certainly a serious proposition. I see hundreds of letters passing through my office back and forth between railroads and private car lines, and it is a continuous proposition of writing letters back and forth. I should like to hear some of the billing supervisors tell us some of their experiences in handling correspondence between various railroads.

F. A. Eyman (E. J. & E.): Talking about the correspondence, perhaps some of you keep in touch with that correspondence. If you do, as our worthy president here has said, you see hundreds of letters going over the tables, and answers to those letters are required. It is a big problem.

H. Andrew (N. Y. C.): We could avoid a lot of this correspondence if we would remind the bill clerks that the men on the field with the intelligence and knowledge that they have, surely are not going to put before them a program that eventually they would have to retract and acknowledge to their supervisors, that they were wrong in submitting the bills. I believe that we could educate our bill clerks in the construction of equipment and eliminate a lot of this correspondence.

B. J. Jamison (Southern): I should like to say that is the reason we fellows in the billing game more frequently have been urging our bill clerks to come into this association, and we have accomplished a great deal in the way of educating our bill clerks in the construction and maintenance of cars in order that they might intelligently render a bill. We are glad to know that so many of them are here today, and we hope that they will keep on coming and by and by they will all be educated.

D. E. Bell (C. N.): The answer to Question No. 1 is "No." I presume that the answer only applies to a part which is not defective. The next point is the recommendation for a note to be inserted under Item 157-A of Rule 101. I presume that the Price Committee have already considered the prices that they have allotted for the application of a door to a car. The price in Rule 101 includes the application of the door to the car, so I presume the removing of fixtures and any other items which are not attached to the door is included in that price.

E. S. Swift (Wabash): It was the intention of your committee that no charge could be made for the part that was not defective. In other words, you had no authority to clean the triple valve on passenger equipment if only the cylinder was dirty.

In regard to the charge of the R. & R. for the door, I don't know whether I ought to say this or not, but there is a Price Committee docket saying that fixtures not attached to the door, such as back door stops, for instance, but necessarily R. & R., in order to apply the door, are chargeable. It was that question that caused a lot of controversy between billing departments because some of them have those price dockets and others do not. It was our intention to try to clarify the rules so that correspondence on such subjects would be eliminated, and we thought that if they would insert that under Item 157-A it would cut out all the unnecessary correspondence about those labor charges.

J. E. Mehan (C. M. St. P. & P.): I am just won-

dering about the answer to Question No. 1. As I understand the question, it is a case of a passenger train car that has, for instance, a cracked cylinder and the brake is in date, and if the party who replaces that cracked cylinder cleans the brakes, I understand the question is answered that he couldn't charge the car owner for cleaning those brakes under those conditions. I wonder where the committee got the answer "No" to that question.

Mr. Swift: He is going to run me into something deep, I am afraid. There is a lot of passenger equipment carrying two or three different dates on various cylinders or control valves or the UC triple valves on those cars. The cylinders may carry a different date from the triple valves. We found nothing in the rules that would permit the repairing line to clean that triple valve which showed a date on it that wasn't nine months old when the cylinder was defective. I think the whole trouble is with the stenciling of air brake dates on passenger equipment. I am sure there should be some sets of instructions as to whether they should carry one or more stenciling marks or should carry just one stenciling mark as a freight car does.

Mr. Mehan: I will refer you to Interpretation 2 of Rule 60 which, of course, is covered in the freight car rules. And if you will turn to the passenger car rules on brakes you will see that Interpretation 2 of Rule 60 of the freight car code, applies to the passenger code. In that Interpretation 2 it says that in the case of a defective cylinder being removed the brakes may be cleaned, even though they are in date, and charged to the owner. With that interpretation applicable to passenger train cars, how is this answer correct?

Mr. Swift: Well, we are taking into consideration, of course, passenger cars carrying more than one date. In the passenger car rules the prices for cleaning cylinders are separated. You can clean a cylinder and charge for that without cleaning the triple valve, or you can clean the triple valve and charge for that without cleaning the cylinder. It is done every day on passenger equipment. If it is the intention that you can clean the entire brakes and charge for them, why is it that they put separate prices in the passenger rules for cylinders and for triple valves or control valves? The point as we saw it was that you could clean either one and not the other. Therefore we saw no just reason for cleaning both of them in order to make the charge as required by the freight rules.

Mr. Mehan: Maybe I didn't make myself clear. It is true that the prices are in the book for those separate operations, but the case as I understand it is one where the man really did perform the labor of cleaning the brakes, and the question is asked when he does perform that labor, can he make a charge against the car owner, and the answer is, "No." I am wondering whether that answer cannot be modified in some way so as not to mislead people. Strictly under the interpretation of the rules, if that passenger train car had a cracked cylinder and the brake was in test, notwithstanding that we have a separate set of prices for these separate operations, and if that repairing line actually cleaned those brakes, as this question indicates, why can it not charge the car owner for the cleaning? In other words, I wonder whether this answer "No" is not misleading, because if it were strictly under the rules that would be all right.

Mr. Swift: Well, the only thing I have to say is that your committee has a different opinion of interpretation of the rules than Mr. Mehan. We had members from 10 or 11 different companies and they all seem to be of the same opinion. It is therefore evident that the information contained in the passenger car rules on cleaning air brakes is not clear, and it is not being handled that way.

On motion, the committee received a rising vote of thanks for its report.

Discussion of A. R. A. Interchange Rules

M. E. Fitzgerald (C. & E. I.): I know of no better way to open a discussion of the A. R. A rules than to submit for your consideration the report of the Arbitration Committee to the convention at Los Angeles, Cal., a copy of which you will be able to procure as well as Supplement No. 1, now in effect, of the reports of the Arbitration Committee covering rule changes, which, of course, will only govern rule changes effective the first of the year. But it is important, we believe that we review those recommended rule changes as covered in the Arbitration Committee report.

I presume that all you gentlemen came to this meeting with a rule book Supplement No. 1 and the report of the Arbitration Committee. In order to start off the discussion I feel satisfied that we should first take up and review Supplement No. 1 and if any particular questions are to be raised regarding the application of rule changes as covered, those questions may follow.

Mr. Fitzgerald: We will call out the rules and if there are any questions to be raised we will entertain them.

Rules 2 and 3

W. J. Owen (C. I. I., Peoria & Pekin Union): There is a new interpretation added to Rule 2. The following interpretation of this rule has been rendered by the Arbitration Committee: "Question 5. On basis of Section (c), is the receiving road permitted to reject a load of poles on a flat car because of shifting, even though the load may have originally conformed to the A. R. A. loading rules?" The answer is "Yes."

I am wondering if it was the intention of the Arbitration Committee to simply confine that to poles, or if that could be construed to mean that it covers any open top load that has been shifted, machinery, if you please, loaded on a flat car, poles on an open top car, or steel or pipe that might be shifted. I am wondering if it is the intention to cover all of those items that might be shifted. Undoubtedly the Arbitration Committee went into that extensively before they made this decision. Possibly there is something in there that I am unable to see at the present time, but personally I am unable to see how that is going to benefit or expedite the movement of cars. That is my personal opinion. That will retard the progress of the car instead of expediting its movement.

T. W. Trapnell (C. I. I., Kansas City): If our friend Owen will look at Rule 3 on page 21 he will find that one can return any car that comes under any provision of Rule 2. I agree with him though that in the place of moving or expediting the loads we are retarding them and filling up our terminal when undertaking to return cars of that character. The intention of these rules is to expedite the movement and not retard it, and I believe that should be modified. In fact, the entire Rule 3 relative to matters of setting back the loaded cars should be remodeled so that we will move the commodities through in lieu of tying them up and then return to the various lines that delivered them.

Mr. Fitzgerald: In answer to Mr. Owen I can't help

construe the rule as given to us to mean that it applies to any commodity that is shifted, and I quite agree with him that it posisbly will cause, if applied as given to us, a lot of delay to equipment in large terminals. We have movements of some 30 miles and we may start a car out on an interchange delivery in very good condition and, due to transportation shocks and conditions en route to point of interchange, that commodity will become shifted. If this rule were applied, naturally it would result in rejection of load and back haul of some 30 miles. On the other hand, of course, it seems in a way absurd to effect delivery of a car to a connection knowing at the time you effect the delivery that it was shifted. I believe that possibly if the road would introduce a campaign of proper and better loading we might get away from some of this trouble. Taking it literally as written, I feel that it is permissible to reject a shifted load of any commodity tendered in interchange.

J. J. Gainey (Southern): I quite agree with Mr. Fitzgerald. I think the rule is plain and the Arbitration Committee could not answer it in any other way. You have a perfect right to reject that load on an open car. While there are not many roads who do that, they take the car and adjust it and charge the expense to the delivering line.

Mr. Owen: I should like to ask a question. Is it the opinion that this just simply refers to poles, or does it cover any open top loads?

T. J. O'Donnell (C. I. I., Niagara Frontier, Buffalo, N. Y.): It is my opinion in working for the railroads under the mechanical section rules we should work under those rules without being technical.

Mr. Owen: That is the answer I expected to get from Mr. O'Donnell because I don't believe they know any differently down at Buffalo. Some of the cars coming through Peoria from Buffalo are ridiculous. I suppose he feels the same way about Peoria when he sees loads going through Buffalo, but nevertheless they are shifted. They were properly loaded in the first place but they are shifted slightly, and if you are going to have a technical thing about rejecting these loads you are going to have a backward movement of 30 or 40 miles, as Mr. Fitzgerald says, which is not very progressive.

Mr. O'Donnell: I think Mr. Owen is big enough with his forty-eight years of service to know that the man we want at the interchange point nowadays is the man who does the act and kicks afterwards. He takes the loads, fixes them up and doesn't bother the superintendent, general car foreman or master car builder, but if he feels that the delivering line is using any surreptitious method to get rid of something, he should apply the medicine and give him a physic to take the load back and fix it up.

Mr. Jamison: The reason that that interpretation was put there is because a great many people say, "Well, I can't help your load being shifted. We loaded it according to the A. R. A. loading rules, and that is all we are going to do." That is all that this interpretation is established for, that although you complied with the A. R. A. Rules when you loaded the car originally, if it becomes shifted en route then it stands just the same as any other shifted load. The receiving line must bear the expense of adjusting.

W. R. Rogers (C. L. I., Youngstown, Ohio): I don't for a minute think that Mr. Owen or any chief interchange inspector in this country is going to deliberately tie up the forward movement of loads when he can make the delivering line responsible. I don't think there is any use of arguing over a little point of that kind. It is not going to change my practice one bit. If the loads come forward to the receiving line shop I am going to slip the delivering line adjustment authority and that is going to settle it.

Mr. Fitzgerald: A great many of the changes in Rule 3 are merely extensions of dates with the exception of (7) which reads as follows: "(7) Brake beam hangers and brake beam hanger pins conforming to A. R. A. Standard required on all cars built new or rebuilt on or after January 1, 1930. From owners." It is going to be very important that that matter be followed up. It will save us trouble and delay in handling equipment.

Rule 26

R. Vineyard (M-K-T): I should like to call attention to the new paragraph that has been added to Rule 26 which provides that in the renewal of arch bars or tie bars, all box and column bolts must be of at least the dimensions shown on Plates 3 and 4.

Plates 3 and 4 have reference to trucks of 100,000-lb. capacity. It would appear from this rule, according to this new paragraph as written, that where arch bars are applied under Rule 26 you would have to apply column bolts and box bolts as shown in Plates 3 and 4. Through communication with the Secretary of the American Railway Association it was found that this article should have referred to Plates 1, 2, 3 and 4.

Mr. Fitzgerald: I believe, gentlemen, that he is correct, and it naturally follows that if it is essential to follow a standard strength of bolts throughout the 100,000-lb. it is likewise necessary that we should reinforce and take care of the 80,000-lb. capacity cars.

Mr. Gainey: If you are to follow this Rule 26, you have boxes that will not take the standard bolts, also columns that will not take the standard bolts. I should like to know from the members of this association what their proper interpretation is. Are they going to change the columns, the boxes and the arch bars and charge it all to the owner of the car, or are they going to bear that expense themselves?

Mr. Andrews: So far as I have been able to find, there is not much conflict in this rule for this reason: The A. R. A. has provided that a certain thing must be done and in the event you proceed to do that thing they have provided that all of the undamaged parts that are removed in connection with making this change shall be credited as scrap. It is my understanding that in effecting this change I could apply A. R. A. oil boxes and column posts, of which there are many such, and I could bill the owner for them and allow him scrap credit for those parts that were removed undamaged.

Mr. Fitzgerald: Perhaps we might clarify the situation by reading the rule that gives us that authority. In the third or fourth paragraph the Rule reads: "Any increased cost resulting from and the expense of alteration necessary for the first application of these details shall be charged to car owner. Scrap credit shall be allowed for undamaged parts thus removed." The new rule compels us to apply the bolts and I think that is what they want us to do to bring these trucks up to a certain standard.

Mr. Mehan: It seems to me from the discussion that we have all kinds of boxes, columns, etc. that have to be drilled out for these bolts. We don't find many of them. It seems to me that if we are having that trouble we ought to let the American Railway Association know something about it so they can provide for your relief in the Rule.

I notice that they have amended the Rule this year to take care of increased bolt sizes. They seem to be trying to take care of all these exigencies, and if anybody has oil boxes that have to have the bolt holes bored out for the bolts or columns that have to be drilled for the proper size bolts, if it develops that there are such things existing, we should pass some resolution here and send it to the American Railway Association asking them for some relief.

Mr. Fitzgerald: I believe the incoming A. R. A. Committee will be glad to receive any information from any member of the association in connection with any trouble he might experience in attempting to follow this Rule during the coming year. Then we might be able to do something and get some relief.

Rule 35

Mr. Trapnell: Yesterday or the day before two interchange points were spanked on the floor of this convention with the idea that they were abrogating safety rules adopted by the American Railway Association. I want to tell you, gentlemen, that here is one point that is not abrogating any of the rules. We are using common sense. We are closing the doors before we deliver the car and should a door not be closed, the line that receives the car takes it up with the office of the chief interchange inspector and he goes after the line that delivered the car with the door open. There is absolutely no abrogation of the rule. We believe in safety just as much as anyone else, and we practice it to see that the car comes through in good shape, but we don't spend seventy-five cents to collect twenty-five cents in billing. That is all. That's the thing that is wrong all through the rules. Today you want to cut down the expense of billing; yet you are adding these small items telling what we can do and get nothing out of it.

Rule 91

Mr. Jamison: The note that follows Rule 91 in the Supplement states, "With a view of effecting further economies in the cost of handling bills for car repairs, it is suggested that checking for car numbers and location be eliminated where the total charge per car is not in excess of $1.00, because it is usually found that corrected numbers are furnished or locations verified. However, this provision is not mandatory?"

I, for one, should like to see it mandatory. The greater part of our exceptions today involve wrong numbers. Someone this morning spoke about our bill clerks being educated on the construction of cars in order that they wouldn't take improper exceptions. I hope he realizes that our bill clerks have been educated to a large extent and the education is continuing and the exceptions are going down in that matter to a very small number. The large volume of exceptions that are taken now are wrong car numbers. Of course my experience is limited to the system with which I am connected. Now we have this idea that if the billing on the repair card did not amount to more than $1.00, even though the number didn't check on the car accountant's office records, they wouldn't take exceptions.

I am just wondering whether or not this body would entertain a motion to ask the A. R. A. committee to frame a resolution to the American Railway Association to make that mandatory

I move that our A. R. A. Committee formulate a resolution to the American Railway Association to the effect that this body is in favor of making mandatory the note following Rule 91.

The motion was seconded and carried.

Rule 108

Mr. Bell: Rule 108 tells us that we can't make any material or labor charge for nuts, nut locks and lock nuts (including unit nuts) all types, 1⅜ in. or smaller. Rule 26 tells us that we must apply nut locks. This may be hair splitting, but I should like to know what protection the car owner will have if nut locks are not applied to the box bolt when you apply the new A. R. A. standard arch bar.

Mr. Fitzgerald: Do you gentlemen understand that the item just called to your attention is covered in connection with Rule 108, Sec. (b)? There is an indication that there would be some conflict in there inasmuch as they have it under another item covering no labor or material charge for the following items, and so on. I take it that in connection with a condition involving the arch bar, you would charge for that item. It is a combination job.

Mr. Bell: I am not concerned with the charge that will be made; I am concerned with the question as to what protection the car owner will have on account of not having made proper repairs. Rule 101 tells us that no labor or material charge can be made for a nut lock; Rule 26 says we must apply them.

Mr. Fitzgerald: As I look at this thing, I think it is going to be necessary that our A. R. A. Committee take this particular question up with the American Railway Association for an interpretation. We will attempt to get something on that. Will that be satisfactory?

Mr. Jamison: Would you include in that all the body truss rod question?

Mr. Fitzgerald: Yes.

H. L. Raymer (Grand Trunk): I don't know whether or not I have Mr Bell's thought in regard to this question. The practice that we follow on our road is to apply the nut locks as per Rule 26, show it on our billing repair card, and make no material or labor charge other than the labor allowance for the new arch bars. Rule 108 says that there is no labor or material for nut locks under 1⅜ in. in length.

Mr. Swift: The .4 hrs. includes the tightening of the rod, the proper tightening of the rod, and where our men show a body truss rod applied with nuts used, we send the card back and ask them if they tightened the rod. If they tightened the rod they show it on their repair card and we show the .4 hrs. opposite the tightening of the rod and not opposite the nuts. (Laughter).

The last gentleman who spoke didn't understand Mr. Bell's point. As I understood him, we apply standard bars according to Rule 26 and make all proper repairs with the exception of putting on the nut locks that are required. The car owner comes back at us for correction and possibly we give him a defect card for those missing nut locks. How is he going to charge them back to us when there is no charge in the Rules for it? That's what he was trying to get at, I believe.

Mr. Owen: I should like to answer that. You give me a defect card account of no nut locks applied and I will charge you on that for the bolts that I use and changing it to put those lock nuts on, not the lock nuts, but the nut locks, and it is specified that you must apply the nut locks. Again, not the lock nuts but the nut locks. If you put the nut locks on you have to take the bolt out to do it. You have to take your nuts off and remove the bolt. If you are using a defect card there is no reason why you can't charge for that. They can charge you for the labor and material on the bolt.

C. J. Nelson (C. I. I., Chicago): Before we leave the subject I am wondering if it wouldn't be well to re-

quest the secretary to place the question before the Arbitration Committee. Some companies seem to find a conflict in there that should be straightened out. If I am in order I make that as a motion.

The motion was seconded and carried.

On motion, it was voted to close the discussion.

Report of A. R. A. Committee

During the past year, your committee received twenty communications treating the subject of recommended changes in A. R. A. interchange rules. Due to certain changes in methods of procedure, partially brought about by the reorganization of this body, these communications referred to were forwarded to Secretary A. S. Sternberg, who placed them in the hands of your A. R. A. committee chairman at the February meeting of the board of directors, who were then in session at Chicago for the purpose of making recommended rule revision as well as other routine duties.

Your committee had no previous opportunity to review these questions as submitted; however, all of the communications were read to and placed before the board of directors, and such other members as were present at this board session. All of the communications received careful consideration, and were thoroughly discussed on the floor, and were either there disposed of or were forwarded, approved by the board, to the A. R. A. Arbitration Committee in the form of recommended rule changes.

The action of the Arbitration Committee on problems, as submitted, is fully reflected in that committee's report made to the A. R. A. Convention at Los Angeles last June, at which time many of the recommended changes were formally adopted, and will appear in the Code of Interchange Rules, effective January 1, 1930. Some few corrections and changes, in line with proposals submitted are covered in Supplement No. 1 to the present Code of Rules, effective August 1, 1929.

Your committee also received, through Mr. Sternberg, certain communications from members making inquiry as to rule applications, or interpretations thereon, and have carefully considered such inquiries as follow herein, indicating in answer the opinion of the committee, which is not mandatory or binding, but is merely the opinion of the committee after careful consideration.

Question 1. (Rule 2, par. (e)—(a) What is meant by "third rail clearance"? (b) Where is this third rail situated?

Answer—The third rail, as considered by this rule is the charged rail of an electric railway, and performs the same function as the overhead trolley wire common to street railway line service. This charged rail is located, as a rule, about 20 in. from the gage line of running rail and extends about 6½ in. above the top of the running rail. Equipment operated in lieu of ordinary trolley pole is constructed with an extension outward from the truck of the car equipped with a sliding shoe which engages and forms contact with the charged or third rail.

The idea of showing these clearances in the equipment guide is to protect against any part of the car, other than contact shoe, from coming in contact with this charged rail. Such contact would bring about a short circuit.

Note: Some few cars, so constructed that truck spring planks, truss rods, drop doors, and other car parts do not meet clearances, will bring about such short circuits.

Question 2 (Rule 2, par. (f), sec. (4)—Does not Arbitration Case 1558 automatically abrogate the provisions of Rule 2, par. (f), sec. 4?

Answer—No. Case 1558 has to do with a combination center plate and bolster filler, forming part of the center sill and bolster structure. The Arbitration Committee makes this question quite clear in their decision, and your committee feels that the position of the Arbitration Committee in this case is well taken.

Question 3 (Rule 3, par. 1, 3, 4, 6, and various other provisions)—According to the specific provisions of certain paragraphs of Rule 3, loaded or empty cars may be rejected in interchange, and there seems to be conflict as between said Rule 3 and Rule 2. Why permit the refusal of cars in interchange, when, under the provision of Rule 2, and Interpretation 4 of Rule 3, you are not protected with delivering line transfer authorities?

Answer—Your committee was of the unanimous opinion that the various provisions of Rule 3 should be more specific, as to make clear the intent, which we take it is to enforce the standards of the Association. Empty cars not meeting the requirements of this rule should, in our opinion, be rejected. On the other hand, if cars are offered under load, great care should be exercised in an effort to make repairs under load, rather than effect transfer of high class lading. The Arbitration Committee have gone on record as so interpreting this rule, and your attention is directed to Interpretation 4, page 21, 1928 Rules, and to the revision of that particular interpretation now incorporated as Interpretation No. 5, Rule 3, covered in Supplement No. 1, effective August 1, 1929. Your committee feels that the best interests of the railroads we serve would warrant careful consideration of and an effort made to eliminate unnecessary rejection of and transfer of loads.

Question 4 (Rule 9, Interpretation 4)—Assuming an axle is removed without owner's defects on wheels, per Rule 86, section (d), and the journal measures elongated 13/32 in. over standard length, must we consider journal elongated ⅜ in. and credit same as good second hand axle, or can such axle be judged as scrap and so credited?

Answer—Axle cannot be considered scrap. The above question was discussed at the February board meeting, at which time it was considered that such a journal should be scrapped when worn over ⅜ in. Your committee, however, must be governed by the opinions of the Arbitration Committee, and we would call your attention now to Interpretation 4 Rule 9, Supplement 1, effective August 1, 1929, and in connection with this proposition, we, your committee, would respectfully suggest that changes be made in Rule 86, paragraph (c), changing that portion of rule section now reading

". . . the length of journal must not exceed ⅜ in. over standard length. . . ."

to read

". . . The length of journal must not exceed 7/16 in. over standard length. . . ."

The reason for this is to avoid conflict as between Rule 86 and Rule 9, as interpreted, and to clarify future handling.

Question 5 (Rule 60, Interpretation 2)—Just how far does the word "inoperative" govern in the recleaning of air brakes less than sixty days?

Answer—Your committee has at hand two inquiries in connection with application of Rule 60, Interpretation 2, and in discussion it developed that there is without question a universal misapplication of the intent of that provision of this rule as governed by Interpretation 2. It is the opinion, due to established common

practice on railroad shop tracks, that the employees engaged in this work should be so advised and educated as to eliminate the apparent unintentional sharp practice which now exists. We feel that you will go along with us in assuming that the Arbitration Committee's intent in this matter is that an air brake cylinder or triple must fail to function under test, where there is no visible external evidence of any existing defect, in order to warrant reclaim against the original repairing line.

Question 6—If a foreign line applies type "D" coupler 8½ in. butt (not standard to car except as to butt) and stencil car "A.R.A D coupler 5-in. by 7-in. shank," may car owner obliterate stencil and waive objection to coupler applied, and have charge for stenciling canceled on authority of joint evidence?

Answer—The Arbitration Committee, in reply to Question 15, Rule 17, has left the question of acceptance or rejection of betterment charge strictly up to the car owner, in connection with the application of type "D" coupler not conforming to standards. This, then, would settle the question of owning line waiving objection to coupler charge.

Treating with the question of stenciling, your attention is directed to Section (c), Question 15, Rule 17, and the Arbitration Committee's answer to Section (c), to the effect that it would be improper to stencil such a car as equipped with type "D" coupler. Therefore, owning line certainly could object to charge covering such stenciling. In fact, owning line is not obligated to accept betterment or stenciling charge.

Question 7—Does Interpretation 17 to Rule 17 mean that the substitution of riveted draft attachment for cross key attachment impairs the strength of car, or does it mean that the A.R.A standard yoke, when substituted for any cast steel yoke, impairs the strength of the car?

Answer—Your committee, in answering this question, must assume that in making this inquiry old type cast steel experimental yokes are under consideration, a great many of which are now working their way to the scrap pile regardless of condition, and we feel that we should go on record as construing this interpretation to apply only to the recognized permissible cross key attachment.

Question 8—If a car interchange association issue their defect card against a delivering line for Rule 32 damage, and if after car is received home, joint inspection reveals the fact that defect card does not cover all defects, who should furnish the additional protection—the car interchange association, or the line against whom the defect card was issued?

Answer—Strictly under the provisions of interchange rules, interpretations, and decisions, defect card protection for delivering line damage must and should be received at point of interchange. Too many inspectors, foremen, and others are of the opinion that damage in many instances cannot be fully covered. We do not go along with this view, and feel that if various lines would instruct and educate their forces to card absolutely all damage requiring repairs which is cardable under the rules, at the point of interchange, an immense amount of money would be saved the trunk lines of this country, and there would be a great deal of unnecessary correspondence eliminated.

In treating strictly with the question placed, the owner is entitled to full card protection from the trunk line delivering the car home. It then rests with the damaging line as to whether or not they would assume responsibility for the additional items of damage. Acting strictly from the point of precedent established, your committee feels that if the original damaging line is satisfied that they did bring about the additional items of damage involved, then they should protect, just the same as in the case of fire damage invisible from exterior inspection. This, however, is not mandatory, under rules of decisions.

Acting on instructions from your board of directors, your committee gave careful consideration to the question of segregating of A. R. A. rules, particularly in placing of all rules strictly governing interchange in separate sections of the present Code of Rules. Your committee feels that no good purpose would be served by such a segregation, and that if any individual road or line so wishes, they may, by bulletin instructions, make any segregation they feel advisable. Such a bulletin, treating merely with rule numbers and serving as a guide to inspectors, would, in the opinion of your committee, get the desired results, and would be preferable to making such a radical change in the present Code of Rules.

The report was signed by M. E. Fitzgerald (chairman), general car inspector, Chicago & Eastern Illinois; J. Matthes, Jr., general car inspector, Wabash; W. R. Rogers, chief interchange inspector, Pittsburgh & Lake Erie; O. H. Clark, superintendent of car repair bills, Missouri Pacific; George Burbie, chief inspector, Swift & Company; J. J. O'Brien, superintendent of car department, Terminal Railroad Association of St. Louis; and F. A. Isaminger, superintendent of car equipment, Roxana Petroleum Corporation.

Discussion

W. J. Owen (C. I. I., Youngstown, Ohio): There is just one question I should like to ask Mr. Fitzgerald, that is, what he means by the words "visible external evidence" on the cleaning of air brakes. I wonder if he would just clarify that.

M. E. Fitzgerald (C. & E. I.): The questions as submitted to the committee were to the effect that certain exceptions can be taken to bills demanding cancellation of charges where the records were not clear as to what really brought about the cleaning, the subsequent cleaning. In other words, there was one question submitted which had to do with a broken retainer valve, and considerable correspondence was exchanged between the respective interested lines, and it was the opinion of the car owner that he could request cancellation, basing his argument on the fact that the brakes were inoperative. The question was what do they mean? Your committee feels this: that it is the real intent of the arbitration committee, for example, that if a car moves to a repair track with no visible defects such as broken parts of cylinder, triple or retainer, and if everything is apparently in good order and the car is bearing your road stencil, and then with a single car test that triple fails to function, you have a perfect right as a car owner to reclaim against the original repairing line; but if, on the other hand the next car has a visible defect which forces you to clean the car, then why should you reclaim against the original repairing line who made a perfect repair job for you?

Mr. Owen: Just one more question. Is there any chance of getting out of it regardless of whether it is a visible or invisible defect that caused the inoperation?

Mr. Fitzgerald: There is no way for you to avoid reclaim, but it was hoped by the committee that with this explanation furnished to the car men of this country they would at least give it a little consideration, and we believe they will. We believe that if the matter is put up to the repairing forces like that there will be

unintentional sharp practice if they do not follow reasonable methods of handling this business.

D. E. Bell (C. N.): I heartily endorse the committee's stand with regard to Rule 3, adopting as a principle the fact that you can demand transfer of authority if you can't effect repairs. Adopting the principle as outlined in new Interpretation 5, you can't demand transfer of authority if you can effect repairs on your road. That seems to abrogate Par. 3 of Sec. C. which tells us that couplers having riveted yokes without lugs, where such yokes are riveted direct to coupler, are prohibited in interchange. And yet, according to the principle as defined in Interpretation 5, the receiving line has to make the repairs.

C. J. Nelson (C. I. I., Chicago): I am much interested in Question 8 of the committee's report, and I desire to commend the stand of the committee in their modern decision to the effect that protection for delivering line's defects should be procured at the time and place of interchange.

T. W. Demarest, general superintendent of motive power of the Pennsylvania (Western Region), criticized, and I think with justice, the chief interchange inspectors on account of being far from of one mind in connection with the handling of their problems and carrying out the intent of the interchange rules.

While your chief interchange inspectors are far from being infallible, I question that they are entirely responsible for that condition. I believe that every man that you have working for you in that capacity is deeply anxious to comply with the intent of the American Railway Association to the fullest extent. But I am rather inclined to feel that they are governed too much by higher authority in conflict with the rules promulgated by the American Railway Association, and I am wondering too if that is to the best interests of the railroads as a whole.

I believe that if your management were fully aware of the amount of time that your foremen and many others are losing, and of the amount of money that is spent in dictating letters, using up stationery in tracing for defects that should have been protected at the point of interchange, they would undoubtedly insist on everyone's complying with the intent of the rules.

I believe there should be a reasonable consideration given to concealed associated delivering line defects, and I believe too that you will find most all of the railroads very willing to give protection for such defects based on home shop inspection.

We all know, I believe, that some of the larger points in the United States are running cars on notation records. By that I mean their interchange inspectors are not permitted to issue defect cards, such being left to the duties of the interchange bureaus. I am wondering if sufficiently deep thought has been devoted to that particular practice, or, in other words, has consideration been given to the final results of such action. I earnestly hope that the thought that has been devoted to the problem has not been confined to the benefit that might be derived by the members of the roads at home at the particular point where that practice is in effect, because if that has been done I think it is an injustice to the railroads as a whole.

Gentlemen, I am probably not permitted to take too much time, but I want it distinctly understood that what I am saying is not intended at all as criticism against any particular terminal, but I do wish in behalf of the people that I am working for to endeavor to have this question thoroughly analyzed, with the hope that we can all eventually outline a plan that will be absolutely uniform throughout the country. (Applause.)

T. J. O'Donnell (C. I. I., Buffalo, N. Y.): While Mr. Nelson's remark did not directly refer to this committee report on the carding of cars in interchange under our mechanical ruling, I heartily support Mr. Nelson here and the Chicago district that any car requiring carding should not under any condition be passed through on notation records. It is an evil that we ought to wipe out. You know the correspondence and the trouble we have and have had for the last twenty-five years on that. The mechanical rules are very plain. They tell you what is cardable and what is not cardable. There is not any money in passing cars along from one interchange point to another without absolutely living up to the rules. I should like to offer a motion as follows: "It is the sense of the Master Car Builders' and Supervisors' Association in annual convention assembled that we have heard with very much concern the statement made by the Chairman of the Arbitration Committee, T. W. Demarest, that there is a deviation at certain interchange points from the observance of rules as laid down by the Mechanical Division. It is the sense of the Master Car Builders' and Supervisors' Association that every honorable and honest effort be made to carry out these rules to the letter, in order to carry out the wishes of our officers in expediting the movement of freight and in living up to the rules as they are laid down for all points throughout the country." I move its adoption.

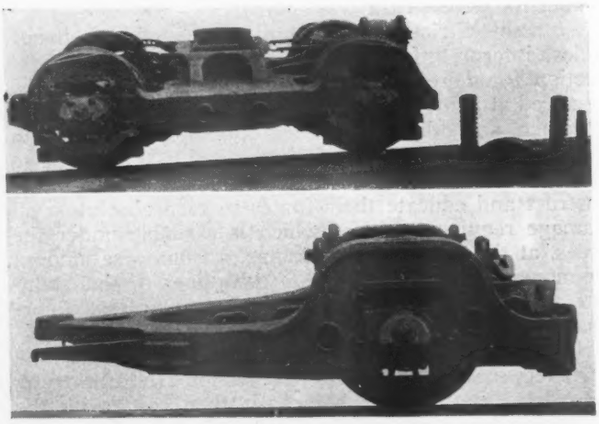
. . . The motion was seconded and carried unanimously . . .

On motion of Mr. Mehan, the A. R. A. committee report was accepted with a rising vote of thanks.

Bearing Tests on the Canadian National

Pyrometer tests of engine and trailing-truck bearings

DURING the past three years, the Canadian National has equipped a considerable number of four-wheel engine trucks, and two-wheel and four-wheel trailing trucks with grease-lubricated outside journals of the floating bushing type. At the present time, there are about 800 of these journals in service



Four-wheel engine truck and two-wheel trailer truck equipped with grease lubricated outside journal boxes, having floating-bushing bearings

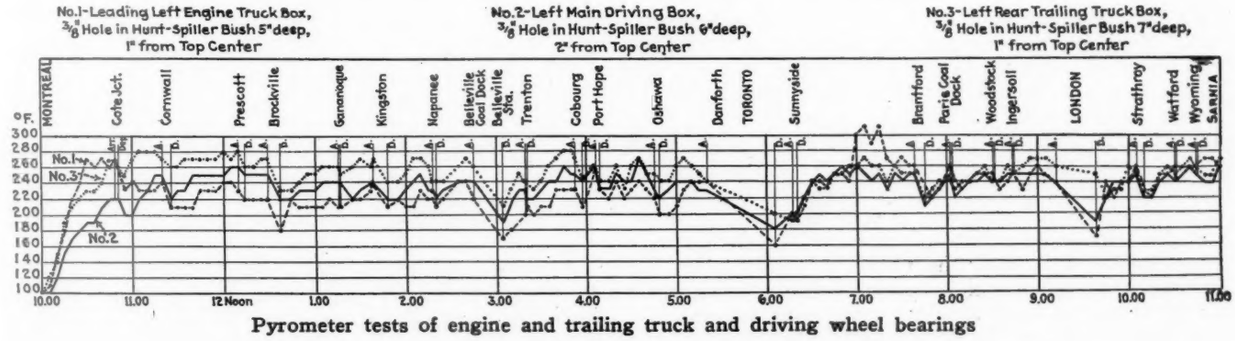
on the system which are giving satisfactory results.

Two applications of this design of box and bearing are shown in one of the illustrations. These designs of trucks are now applied to 20 4-8-4 type locomotives which were built in 1929. The engine truck shown in the top view is equipped with Edgewater ring springs used in conjunction with coil springs. Eventually, this design of box and bearing will be applied to all Canadian National passenger locomotives. The boxes are of steel with stationary Hunt-Spiller iron bushings, keyed in and have bronze bushings next to the journals. The grease is applied by removing grease plugs which are screwed into the box covers. These plugs are so located as to be accessible at all times. Various types of grease retaining rings were tried out. However, the most satisfactory proved to be a plain brass ring.

Tests Made to Determine Proper Clearances for Floating Bushings

A large number of experiments have been made to ascertain the proper clearance to allow for both the inside and outside of the floating bushing. Pyrometer tests were also made to determine the correct grease to use on the bearings, the results of which are shown in the chart.

These tests were made on the driving boxes and trailing and engine-truck boxes of one of the new Canadian National 4-8-4 type locomotives, which was taken out of manifest freight service and placed on passenger train No. 15 from Montreal, Que., to Sarnia, Ont., a distance of 509 miles. This run includes a large number of station stops, and requires heavy work from the locomotive. The speed of the train during the trip was as high as 80 m.p.h. on various occasions. No attention was given to the lubrication of the journals under test during the run.



Pyrometer tests of engine and trailing truck and driving wheel bearings

Results of Tests

In order to insure correct temperature readings, the pyrometer heating elements were screwed directly into the iron bushings in the boxes. Curve No. 1 is plotted from pyrometer readings taken from the front left engine-truck box. Curve No. 2 shows the journal temperatures during the trip for the left main driving box, while curve No. 3 shows the results of the pyrometer tests on the left rear trailing-truck box.

This test run was made on August 29, 1929. It will be noted that the initial bearing temperature in all three instances was 100 deg. F. The highest temperature attained was on the engine-truck box which heated up to 310 deg. F. between Sunnyside, Ont., and Brantford. At no time did the temperature of any of the three bearings run lower than 160 deg. F. The average bearing temperature for the entire test run was between 240 and 250 deg. F.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. R. A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

New Wheels Applied and Removed by Same Road Within Eight Days

The Canadian Pacific applied a new pair of 4¼-in. by 8-in., 650-lb. cast-iron wheels on November 6, 1927, to C. R. R. X car 1576 at Windsor, Ont. The new pair of wheels replaced a pair of which one wheel had a broken rim but the mate wheel was OK for service. The railroad charged T. M. Sinclair & Company, Ltd., the value of two new wheels less credit for one scrap and one second-handed wheel removed, making a net charge of $16.55. On November 14, 1927, eight days later, the Canadian Pacific removed the new wheels on account of the axle journal being cut. A pair of second-hand wheels was applied but no charge was rendered to the car owners. The owners of the car claimed that the charge for wheels applied November 6, 1927, should be reduced to $3.05 which represented the value of two second-hand wheels less the value of one scrap and one second-hand wheel removed. It contended that the car owners had received no benefit of the betterment for which they were charged because of handling line defects, and claimed that although cases of this kind may be fair between two railroads, they are not fair to a private car owner which does not repair foreign cars. In the statement submitted by the car owners the committee was referred to Arbitration Case 1521 and it was pointed out that the Committee recognized reasonable exceptions to the A. R. A. rules. It was contended that this case was a reasonable exception, and that a ruling should be issued permitting a refund of the betterment charge where the owner is deprived of the benefit of the betterment as occurred in this case. The railroad maintained that its charges were correct according to Rule 101 and the provisions of Rule 98. It pointed out that the wheels removed November 14, could not be reapplied as other than second-hand.

In its decision the Arbitration Committee stated: "Under present Rule 98 it is not permissible to charge the car owner for the difference in value between new

wheels applied and second-hand wheels removed on account of delivering line defects. Therefore, it would be inconsistent to allow credit at new value for second-hand wheels removed in the case at issue, notwithstanding these wheels were new when applied a short time previously. The rules do not recognize any difference in the value of cast-iron wheels, as second-hand, insofar as the question of length of service or age is concerned. The contention of car owner is not sustained." *Case No. 1606—T. M. Sinclair & Co., Ltd. vs. Canadian Pacific.*

[Case No. 1521 involves Rule 30 in which one road re-weighed a car and failed to obliterate the old stenciling marks with the result that the second road re-weighed the car but obliterated the old stencil. Both roads billed the owner for re-weighing the car. The owner requested the first road to cancel its charge which it refused to do. The Committee sustained the owner's request.—EDITOR.]

Owner Must Pay for Cleaning Inoperative Discharge Valves on Tank Cars

On January 1, 1928, the Chicago, Rock Island & Pacific steamed out N. A. T. X. tank car 399 and cleaned the discharge valve. The railroad rendered a bill for $5.20 for steaming out the car and for repairs to the discharge valve, to the North American Car Corporation. The car company took exception to this charge, claiming that the work done by the railroad was not repairs. Its objections were based on the grounds that this car was under lease to an oil refiner, and had been delivered to the refinery in a clean and serviceable condition. Therefore, the lessee was responsible for the dirt getting into the tank and it was its duty to remove it. The owners further contended that the work performed by the railroad came under the same category as sweeping out box cars, etc. The Rock Island stated that this car was sent to the shop because the discharge valve would not seat, due to the dirt and debris on and under it, and it was necessary to steam out the tank so as to make it possible for an employee to go inside and repair the valve. Oil companies, the railroad contended, which operate loading racks in oil fields, refuse to make repairs to discharge valves.

It was decided by the Arbitration Committee that "In view of the rejection of the car at the loading point on account of an inoperative discharge valve, the handling line was justified in correcting the defective condition, which occasioned the steaming of the tank. Rule 16 is authority for this work. Rule 92 also applies. The car owner is responsible. Therefore, the bill against the North American Car Corporation is sustained."—*Case No. 1605—North American Car Corporation vs. Chicago, Rock Island & Pacific.*

Consolidated Bills Rendered by Systems Comprising Two or More Railroads

Included in a bill rendered by the Chicago & North Western against the Southern Pacific (Pacific Lines) where items for the application of journal bearings to S. P. car No. 25553 at Mankato, Minn., on December 2, 1927, by the Chicago, St. Paul, Minneapolis & Omaha and again at Grand Junction, Ia., on December 21, 1927, by the Chicago & North Western. This bill also included items for applying journal bearings to S. P. car No. 62570, at Altoona, Wis., on December 27, 1927, by C., St. P. M., & O. and again at Weyeville, Ia., by the C. & N. W. The Southern Pacific took exception to these charges claiming that duplicate journal bearings had been applied. The C. & N. W. declined to cancel these charges and contended that Case No. 1319 applied. The Southern Pacific pointed out that the C. & N. W. rendered bills in which charges for repairs involving both the C. & N. W. and the C. St. P., M. & O., are combined in one bill. It stated that this procedure varied from that of the Union Pacific System which renders separate bills for each of the railroads that comprise the system. It contended that the C. & N. W. and the C., St. P., M. & O. were operated under the same arrangement as the Southern Pacific lines in Texas and Louisiana and claimed that this case was a parallel to Case No. 1371. The C. & N. W. pointed out in its statement that the C. & N. W., and the C., St. P., M. & O. are separate companies under the state laws, and are so represented in the Mechanical Division, A. R. A., as subscribers to the Code of Rules governing the interchange of freight cars. All repairs made to C. St. P. M. & O. cars by the C. & N. W., and vice versa, except at joint stations where special agreements are in effect, are billed against each road monthly on the basis of the A. R. A. rules. At joint stations the cost of doing the work is billed against the road for whom the repair work is performed. Each road maintains its own billing office and issues its own billing repair cards. Foreign roads not making consolidated bills are required to list C. St. P. M. & O. cars separately from C. & N. W. cars, and to show the amount due each company. This arrangement, it was claimed by the C. & N. W., does not alter their status as separate railroads under the law, and the interchange rules. It contended that Rule 99 did not apply to repairs made on both the C. St. P. M. & O. and the C. & N. W., which are included in the consolidated bill for both companies.

In rendering its decision the Arbitration Committee stated, "The contention of the Southern Pacific Company is not sustained. The Chicago & North Western and the Chicago, St. Paul, Minneapolis & Omaha are separate roads insofar as Rule 99 is concerned." *Case No. 1607—Southern Pacific vs. Chicago & North Western.*

[In Arbitration case No. 1319, Union Pacific vs. C. B. & Q., the Oregon Short Line applied a journal bearing to a C. B. & Q. car, and the charge was billed against the car owners. A short time later the Union Pacific applied a journal bearing to the same journal on that car, and the charge was also included in the audit bill to the C. B. & Q. The same repairs were made by the Oregon Washington Railroad and Navigation Company to another C. B. & Q. car, and this road also included the cost of renewing the journal bearing in an audit bill using a Union Pacific billing repair card. The Committee decided that in view of the status of the four roads in question with regard to their relation to the Union Pacific System, they are properly considered as separate roads in the application of Rule 99, and the contention of the C. B. & Q. was not sustained.—EDITOR.]

U. S. STEEL PRODUCTS AND PUBLICATIONS.—The United States Steel Corporation, 71 Broadway, New York, presents in a 52-page pamphlet the following information concerning its subsidiary manufacturing companies: Products and by-products manufactured; location and addresses of sales offices; location and addresses of warehouses; publications descriptive of products; description of educational motion pictures, and an alphabetical index of products. No attempt is made to cover the more specialized or detailed products or processes of any of the companies, but the lists are representative of the type and character of commodities made.

Examples of Recent Passenger Locomotives of the 4-6-2 and 4-6-4 Types

General Dimensions, Weights and Proportions

Type	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-2	4-6-4	4-6-4	4-6-4	4-6-4
Railroad	U. S.	U. S.		Mo.				Can.		So.	C. R. R.			R. F.	N. Y. C.			A. T.
Builder	R. A.	R. A.	A. C. L.	Pac.	N. Y. C.	So.	R'd'g	Pac.	Penn.	Pac.	of N. J.	B. & O.	C. & O.	& P.	& St. L.	N. Y. C.	B. & A.	& S. F.
Road class	A. & B.	A. & B.	Bald.	Amer.	Amer.	Bald.	Bald.	Mont.	R. R.	Bald.	Bald.	Bald.	Amer.	Bald.	Amer.	Amer.	Amer.	Bald.
Road number	Light	Heavy	P-5b	.....	.....	.....	G.-2-S.A	G-3d	K-4s	P-13	G-3s	P-7	F-19	.....	.....	J-1b	J-2a	.....
Date built	.....	.....	1,719	1,153	6,510	1,407	175	2,341	5,495	631	834	5,300	494	325	173	5,230	601	3,450
Tractive force, engine, lb.	1918	1918	1925	1926	1926	1926	1926	1926	1928	1928	1927	1927	1926	1926	1927	1927	1928	1927
Tractive force, booster or aux. loco., lb.	40,700	43,900	43,100	44,000	38,600	47,500	42,800	45,000	44,460	43,660	46,920	50,000	47,500	48,580	39,700	42,300	44,800	44,900
Cylinder horsepower (Cole)	.....	.....	.....	.....	9,950	.....	.....	.....	.....	9,640	.....	Note 2	.....	.....	.....	10,900	10,600	.....
Piston speed at 10 m.p.h., ft.	2,252	2,624	2,252	2,427	2,308	2,624	2,590	2,380	2,690	2,252	2,798	3,017	2,624	2,755	2,365	2,533	2,702	2,477
Engine and Tender Data	214.8	198.6	227.2	214.8	198.6	214.8	196.1	224.1	196.1	228.6	198.6	196.1	214.8	209.1	199.5	198.6	209.1	214.8
Weight of engine, lb.	277,000	306,000	280,610	294,000	297,500	304,000	306,360	306,500	308,890	313,800	326,470	326,000	331,500	332,600	316,500	348,000	353,000	349,500
Weight on drivers, lb.	162,000	197,000	177,460	190,500	184,500	182,000	192,540	183,900	201,830	187,700	197,660	201,000	200,000	205,300	175,500	184,800	187,500	198,400
Weight on front truck, lb.	57,000	49,000	50,800	53,000	54,500	61,000	52,160	62,500	53,640	61,800	65,850	63,000	67,500	62,400	56,500	64,400	65,000	65,300
Weight on trailing truck, lb.	58,000	60,000	52,350	50,500	58,500	61,000	61,660	60,100	53,420	63,800	62,960	62,000	64,000	64,900	84,500	98,800	100,500	85,800
Weight of tender, loaded, lb.	194,000	194,200	187,990	256,400	273,600	226,500	183,400	192,300	171,400	291,100	214,630	214,000	246,100	199,400	208,100	281,500	204,600	287,000
Tender, water capacity, gal.	10,000	10,000	10,000	12,000	15,000	12,000	9,000	9,600	7,850	16,152	10,000	11,000	12,000	10,000	11,000	12,500	10,000	15,000
Tender, fuel capacity, tons or gal.	16	16	16	5,000	16	16	15	12	13½	4,912	15	17½	15	16	16	24	16	20
Wheel base, driving, ft. and in.	13—0	14—0	13—0	13—0	13—8	13—0	13—10	13—2	13—10	13—0	13—10	14—0	13—0	13—0	13—0	14—0	14—0	13—8
Wheel base, engine, ft. and in.	34—9	36—2	34—11	35—3	36—11	36—1	35—11	35—0	36—2	35—7	36—8	37—1	35—7	35—9	37—9	40—4	40—4	38—7
Wheel base, engine and tender, ft. and in.	68—7½	70—8½	70—9½	74—10	79—5½	77—1	72—2¼	67—10	74—8	78—8½	72—2	77—6	76—5¾	74—4	73—7¾	83—7½	76—1½	81—4½
Cylinders, diameter and stroke, in.	25x28	27x28	25x28	27x28	25x28	27x28	25x28	23x30	27x28	25x30	26x28	27x28	27x28	27x28	25x26	25x28	25x28	25x28
Driving wheels, diameter, in.	73	79	69	73	79	73	80	75	80	73½	79	80	73	75	73	79	75	73
Boiler Data																		
Steam pressure, lb.	200	200	200	185	205	200	230	250	205	200	230	230	200	210	210	225	240	220
Fuel	Soft coal	Soft coal	Soft coal	Oil	Soft coal	Soft coal	Coal	Soft coal	Soft coal	Oil	Soft coal	Soft coal	Soft coal	Soft coal	Soft coal	Soft coal	Soft coal	Coal
Boiler, diameter, first ring, in.	76	78	76⅛	76⅜	79¼	78	74	78½	76⅜	78	78	78	82	82	81½	82 7/16	82 7/16	78
Firebox, length, in.	114⅛	120⅛	114⅛	114	108⅛	120⅛	126¼	111 1/16	126	121	126⅛	120⅛	120⅛	121⅛	114⅛	130	130	132⅛
Firebox, width, in.	84¼	84¼	84¼	84¼	90¼	84¼	108¼	84¼	79⅞	84	96¼	84¼	96¼	90	84¼	90¼	90¼	96
Tubes, number and diameter, in.	188—2¼	216—2¼	176—2¼	212—2	190—2¼	216—2¼	162—2¼	Note 1	236—2¼	193—2¼	251—2	212—2¼	212—2¼	214—2¼	224—2¼	37—2¼	37—2¼	214—2¼
Flues, number and diameter, in.	36—5½	40—5½	36—5½	43—5⅜	45—5½	40—5½	34—5½	40—5¼	40—5½	40—5½	36—5¾	40—5½	48—5½	45—5½	45—5½	201—3½	201—3½	40—5½
Length over tube sheets, ft. and in.	19—0	19—0	19—0	20—3	21—0	18—6	19—0	18—0	19—1	18—0	19—0	19—0	20—6	20—6	20—0	20—6	20—6	21—0
Grate area, sq. ft.	66.7	70.8	66.7	66.8	67.8	70.4	95	65	69.9	70.5	84.2	70.3	80.3	75.8	66.8	81.5	81.5	88
Heating surface, firebox, total, sq. ft.	261	327	268	266	257	314	314	291	305	283	379	394	281	278	302	281	281	314
Heating surface, tubes and flues, sq. ft.	3,072	3,497	2,942	3,453	3,695	3,404	2,731	2,981	3,736	3,069	3,444	3,452	3,958	3,897	3,917	4,203	4,203	3,842
Heating surface, total evap., sq. ft.	3,333	3,824	3,210	3,719	3,952	3,718	3,045	3,272	4,041	3,352	3,823	3,846	4,239	4,175	4,219	4,484	4,484	4,156
Superheating surface, sq. ft.	794	887	794	1,054	1,158	860	745	864	943	836	789	932	1,213	1,078	1,103	1,951	1,951	980
Comb. evap. and super. surface, sq. ft.	4,127	4,711	4,004	4,773	5,110	4,578	3,790	4,130	4,984	4,188	4,612	4,778	5,552	5,253	5,322	6,435	6,435	5,136
Proportions and Ratios																		
Weight on drivers ÷ weight of engine, per cent	58.5	64.4	63.2	64.8	62.0	59.9	62.9	60.0	65.3	59.8	60.5	60.6	60.4	61.7	55.5	53.1	53.1	56.8
Weight on drivers ÷ tractive force	3.98	4.49	4.12	4.33	4.78	3.83	4.50	4.09	4.54	4.30	4.21	4.02	4.21	4.23	4.42	4.36	4.18	4.42
Weight of engine ÷ comb. h. s.	67.1	65.0	70.0	61.6	58.2	66.4	80.9	74.2	62.0	74.9	70.8	68.2	59.7	63.3	59.3	54.1	54.9	68.0
Firebox surface per cent evap. h. s.	7.83	8.55	8.35	7.15	6.50	8.44	10.30	8.90	7.55	8.44	9.91	10.23	6.63	6.66	7.16	6.27	6.27	7.55
Firebox surface ÷ grate area	3.92	4.61	4.01	3.98	3.79	4.46	3.20	4.48	4.37	4.01	4.50	5.60	3.50	3.66	4.52	3.45	3.45	3.57
Superheat. surface per cent comb. h. s.	19.2	18.8	19.8	22.1	22.7	18.8	19.65	20.9	18.9	19.95	17.1	19.5	21.8	20.5	20.7	30.3	30.3	19.1
Tractive force ÷ comb. h. s.	9.88	9.32	10.76	9.22	7.55	10.38	11.30	10.89	8.92	10.42	10.17	10.46	8.40	9.25	7.48	6.57	6.96	8.74
Tractive force × dia. drivers ÷ comb. h. s.	720	766	743	673	597	757	904	817	713	766	804	837	613	693	745	519	522	638
Comb. heat. surface ÷ grate area	61.9	66.5	60.0	71.5	75.4	65.0	39.9	63.5	71.3	59.4	54.8	68.0	69.1	69.3	79.7	79.0	79.0	58.4
Notes	b-c	b-c	b-c	a-d	a-g	b-c-e	b-c	a-e	b	b-c-e-g	b-c-d-e	b-c-d	a-e	.....	a-d	a-e-g-k	a-e-f-g-k	b-e

Key to notes: a—Boiler diam., inside; b—Boiler diam., outside; c—Combustion chamber; d—Syphon; e—Feedwater heater; f—Limited cut-off; g—Booster or aux. loco.; k—Type E superheater.
Note 1—Tubes; 28 of 2 in., 160 of 2¼ in. Note 2—Designed for addition of booster which will add 10,000 lb. weight.

One of three new Pullman cars, equipped with experimental upper berth windows, now in service on the Rock Island

Equipment for Rock Island Fast Passenger Trains

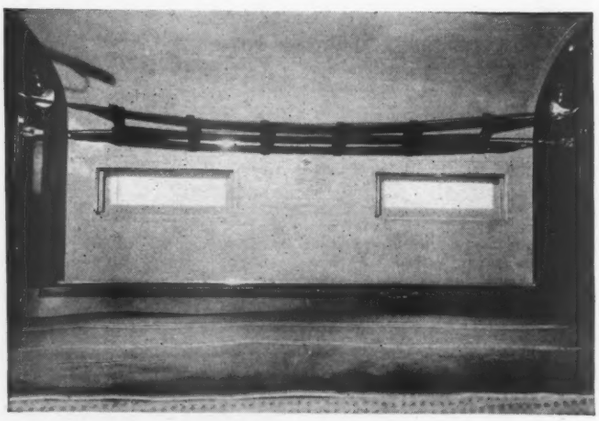
Three Pullmans with trial installations of upper berth windows included—Diners finished in Spanish motif

THREE fast passenger trains of the Chicago, Rock Island & Pacific, including the Golden State Limited, the Rocky Mountain Limited and the Iowa-Nebraska Limited, have been provided recently with complete new equipment, including both cars and locomotives. The Pullman equipment alone includes 52 cars, in addition to the new baggage cars, baggage-smokers, smoking-room coaches, chair cars, diners, club cars and club-observation cars. The motive power consists of five new Mountain-type locomotives. The provision of this equipment will enable the Rock Island to give the latest modern conveniences and service to passengers who ride these trains between Chicago and California, Colorado and the Midwest.

The new locomotives built by the American Locomotive Company are of the Mountain type of similar proportions and design to previous Rock Island 4000 Class locomotives except for the addition of type BK mechanical stokers and Worthington feedwater heaters of the latest design. The locomotives develop a tractive force slightly over 50,000 lb., have 28-in. by 28-in. cylinders and weigh 254,000 lb. on the drivers. Other special equipment include the application of two thermic syphons in the firebox and one in the combustion chamber and the Ohio low-water alarm. Lubrication is provided for by means of 187 Alemite fittings on each locomotive; in fact, all moving parts, except the rods, and all spring rigging connections are provided with this form of pressure lubrication.

The club or lounge cars are 84-ft. all steel cars notable for the completeness and beauty of their furnishings, being identical with those brought out earlier in the year and described in the Railway Age, issue of April 20, page 907.

The Pullman cars are of standard Pullman design



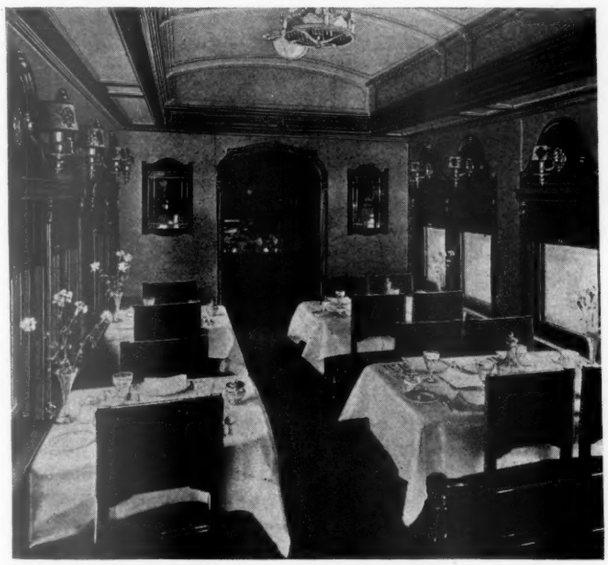
Interior view showing upper berth windows equipped with stationary sash and adjustable curtains

but include several new features which are still experimental in nature. In three of the 52 cars, upper berth windows have been provided for trial purposes, two in each section. The windows have stationary sash and

adjustable curtains of the same material and design as those used in the lower windows. The lower windows, equipped with single brass sash and double glass, are arranged to be raised and lowered by means of automobile-type fixtures set flush with the inside finish of the car below the windows.

Special Lighting Fixtures and Decoration in the Diners

The dining cars, while containing no innovation as far as general proportions and equipment are concerned, combine beauty and good taste in interior dec-

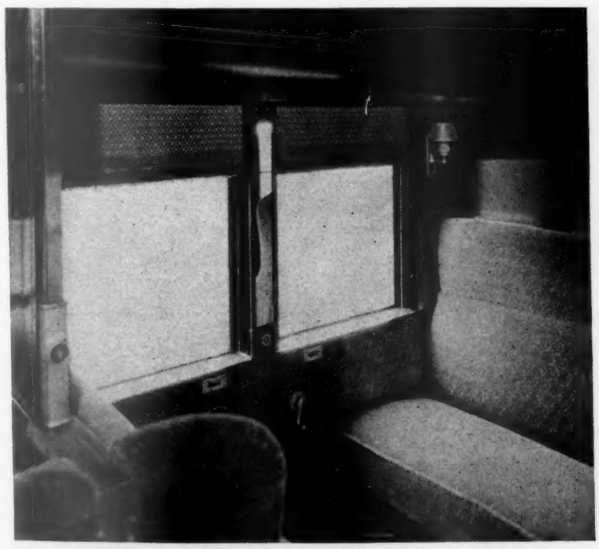


The interior decorations and equipment of the new Rock Island diners are Spanish in character

oration to a high degree. The interior finish in the dining car is Spanish in treatment and this is brought out by making use of natural black walnut combined with a painted side wall. The window trim is of natural color walnut in which shaped mouldings for the window header and carved wood pilasters are placed on either side of the window. A natural walnut deck rail is used, dividing the wall color from the ceiling color. The ceiling is painted a light cream color which harmonizes with the wall color, the latter being tan in tone. Attractive framed mirrors are placed at either end of the dining room, two on each bulkhead, and they are of the same general Spanish motif. A buffet of Spanish design is placed at the bulkhead nearest the pantry.

Special designs of lighting fixtures are used in this car and they, too, are of Spanish type. The ceiling fans, ceiling fixtures and one-light brackets are all of the same motif. The one-light brackets are placed over each window and have mica shades on which a small replica of a Spanish shield is placed, the color on this shield being complementary to the walls and interior furnishings. The lighting fixtures were designed by the Safety Car Heating and Lighting Company.

The general tone of the interior furnishings, including the carpet, upholstery and window shades, is of blue and gold.



View showing automobile-type window-raising fixtures now being tested on three Pullman cars in service on the Rock Island

Tools for Repairing Air Compressors

AMONG the many interesting tools that have been developed for handling air brake repairs at the Parsons, Kan. shops of the Missouri-Kansas-Texas are the reamers and valve-cap refacers shown in the illustrations accompanying this article. They have been designed especially for use in connection with the repair work on 8½-in. cross-compound air compressors.

Fig. 1 shows a line reamer for reaming the main valve bushings in one operation and in perfect aline-

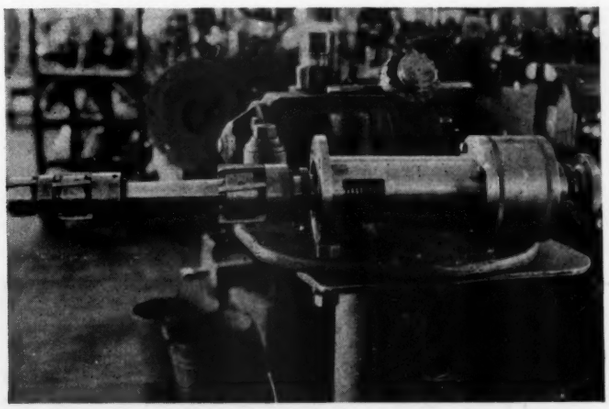


Fig. 1—A line reamer for finishing the main-valve bushings on a cross-compound air compressor

ment, insuring a perfect valve operation and eliminating the binding of a valve in bushings that are not in line. Fig. 2 shows the line reamer mounted on a cross-compound compressor head ready for use. The tool is driven by a square on the end of the arbor, a drill motor being used for power. The practice is to ream the bushings 1/32 in. oversize before renewing the bushings. In Fig. 3 it will be seen that the reamer is made with a long tapered arbor having a four-pitch screw on one end for the mechanical feed, which is

obtained through gears in the reamer mounting. A fine feed or a coarse feed can be obtained by turning a knurled collar which operates change gears.

The reamers are of the expanding-shell type mounted on the tapered portion of the arbor. They can be used in any combination of sizes for the reaming of valve

Fig. 2—A view of the reamer mounted on a pump-cylinder head ready for use—It is driven by a drill motor

bushings. The set-up requires the mounting of the reamer assembly on the compressor head as shown in Fig. 2. It is held in position with the regular cap screws removed from the head. The reamer is trued up with the bore of the valve by means of a boss on

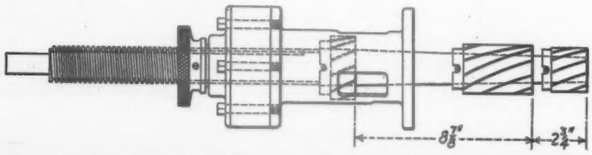


Fig. 3—Assembly drawing of line reamer for 8½-in. cross-compound-compressor main valve

the reamer mounting head. The reamer is self-feeding and after the completion of the cut it is advisable to disengage the feed and turn the reamer two or three times so that no marks will be left at the end of the cut. The approximate time required to ream one head is five minutes.

Fig. 4—The reversing-chamber valve cap reseater in position ready for use

Fig. 4 shows a tool for refacing the boss on the pump cylinder head for the reversing-valve cap joint. The design of the tool is shown in the assembly drawing in Fig. 5. It consists of an arbor which is screwed in the threaded hole from which the valve cap is removed. The cutter is mounted on the tapered portion of the arbor and is fed into the work by a nut which is

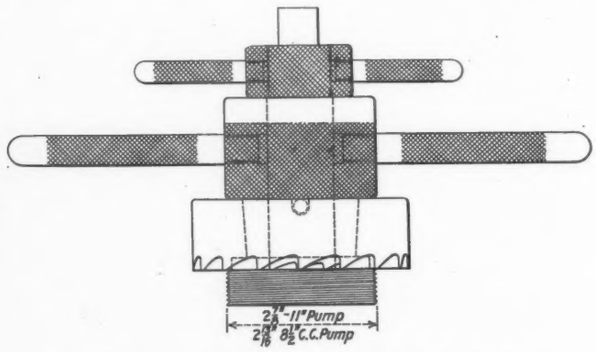


Fig. 5—Assembly drawing of a tool for refacing the reversing valve cap joint

threaded to fit the threaded upper end of the arbor.

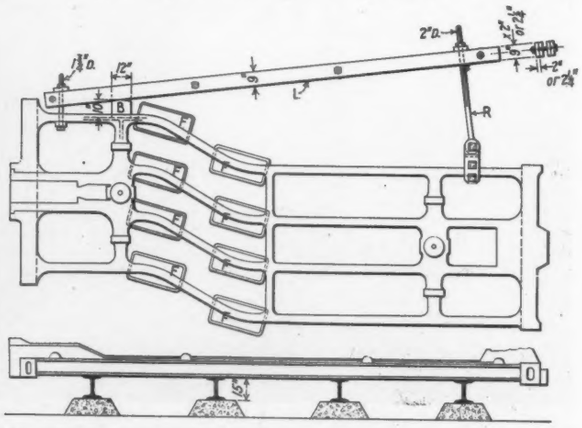
Referring again to Fig. 2, a refacer and tap will be seen lying in the foreground on the pump head. The refacer is for the reversing valve cap and simply screws onto the threaded portion of the cap while the cutter is revolved by hand inside the cup-shaped housing. The cutter is fed by a nut at the top of the housing. The tap with the square shank is for retapping the threads in the reversing valve chamber of the head.

Straightening Cast Steel Tender Frames

By Geo. W. Kelly

Blacksmith Foreman, Central Railroad of New Jersey
Elizabethport, N. J.

A NUMBER of blacksmith foremen have asked the writer for information relative to the method used in this shop for straightening one-piece cast-steel



Device for straightening cast steel tender and passenger-car truck frames

tender frames. Referring to the drawing, the movable containers *F* are designed to burn charcoal, soft coke or smithing coal. All bends in the frame are heated at the same time, and are pulled straight in one heat by means of the screw and nut *R*. This screw is attached to the frame as shown, and moves the lever *L*, which is fulcrumed on the block *B*. Four 15-in. I-beams, which are anchored in concrete piers as shown at the bottom of the drawing, serve to hold the frame during the process of straightening, and also while cooling. This device may be used also for straightening one-piece cast-steel passenger-car truck frames.

Devices for the Tool Room

Three special tools developed on the Norfolk & Western which were shown at the Tool Foremen's convention

AMONG others, the three tool room and shop devices illustrated were submitted by R. B. Loveland, tool foreman, Norfolk & Western, Roanoke, Va., in the report of the locomotive shop devices committee at the 1929 convention of the American Railway Tool Foremen's Association.

These devices include a convenient gage for checking the lead of taps, a set of tools for reconditioning valves and valve seats on low water alarms and a jig for drilling crosshead centers.

Gage for Checking Tap Lead

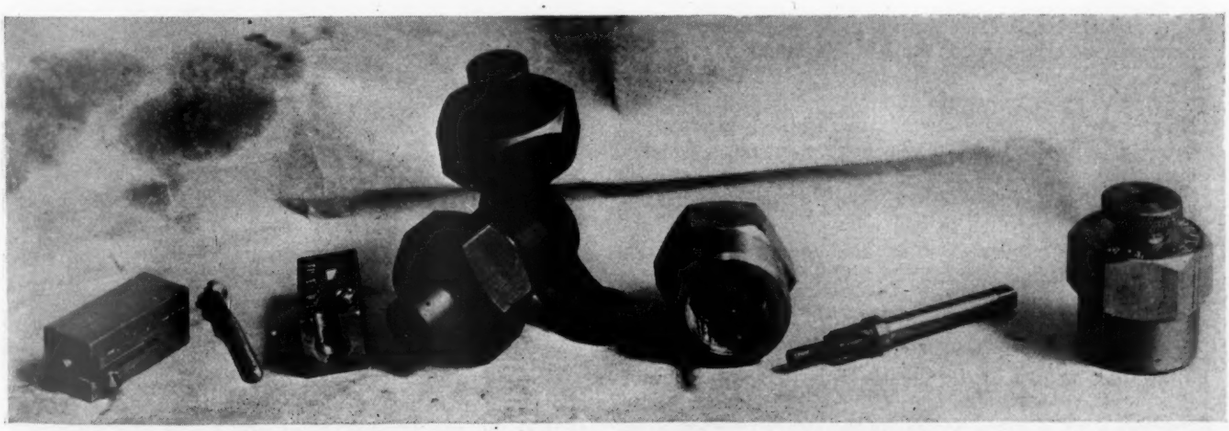
The body of the tool illustrated for checking tap lead is constructed of four pieces of soft steel, 4 in. wide by 5 in. long by $\frac{5}{16}$ in. thick, welded together in the form of a box, which is machined square. An angle cutter having an included angle of 90 deg. is run across the top at the front edge to make the seat for the adjustable and movable bars, which carry the ball points.

A piece of cast iron is machined 3 in. wide by 4 in. long by ½ in. thick, and the 90-deg. cutter is then run across the front edge of this top piece near the end so as to make the other half of the seat for the adjustable and movable bars. Then a piece 1 in. wide by 1¾ in. long is sawed out of the front left-hand corner and 1/64 in. machined off the bottom so it will clamp the adjustable bar. A ⅜-in. hole is drilled and tapped through this piece and the body to accommodate the thumb screw. The rest of the top plate is dowelled and screwed on the top of the body.

There are two bars, $\frac{7}{16}$-in. square, which work through the seat made by the 90-deg. cutter, one of them being adjustable and the other movable. The adjustable bar

Close-up view showing the construction of the crosshead drilling jig

is 7 in. long and has an adjustment screw. The front corner is machined off so as to leave a $\frac{3}{16}$-in. flat. It is then drilled and tapped at ½-in. intervals with a No. 5-40

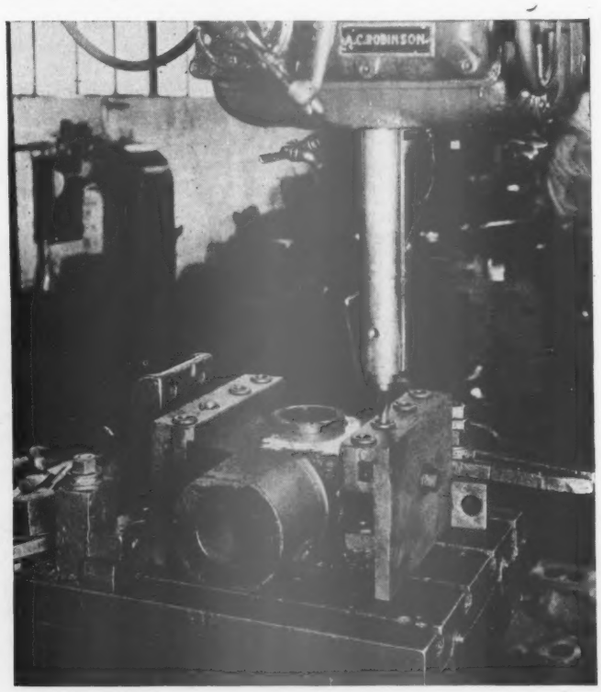


Tools for reconditioning low-water alarm valves and seats

tap to receive the ball point. The movable bar is 2 in. long and is drilled and tapped on the front ⅜-in. from the left end of the bar, with the same size tap to receive the second ball point. This bar is lapped in so it will fit free with no shake. On the back of this bar, in the center, a $\frac{3}{16}$-in. hole is drilled and tapped for a ¼-in. pin, 1¼-in. long. At this point a depression is milled in the frame and top piece to allow for this pin to move sideways .025 in., and a clamp for holding the dial indicator is made.

A small angle plate is attached on the front of the body to act as a shelf to support the tap. The angle plate, which is held by a thumb screw, is graduated on the left side figuring from the center of the points so it can be quickly set at half diameter of the tap. For taper taps, a wedge having half the taper of the tap to be checked is used.

The ball points are made of tool steel and must be made in pairs, having the same distance from the



An effective jig for drilling crosshead centers

shoulder to the center of the ball. They are hardened and ground.

For 12 U. S. threads per inch the ball is .049 in. in diameter; 14 threads, .042 in. in diameter; 16 threads, .036 in. in diameter, etc. By having a ball point of the proper diameter, it is made possible to check on the pitch diameter which is the correct method. For checking taper taps a washer is used to get the point out a distance of half the taper of the tap.

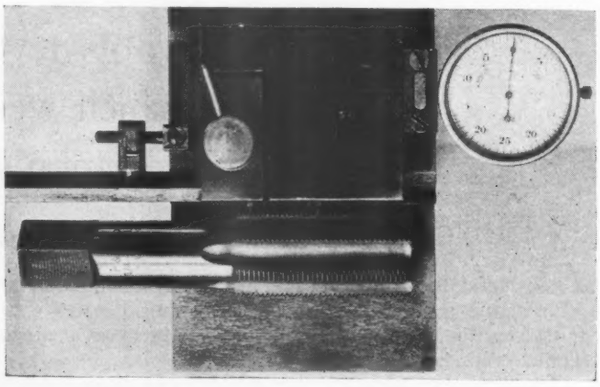
It will be noted that with the holes in the adjustable bar it is possible to check one inch of the length of the tap or at ½-in. intervals to 6 in., as desired. Gage blocks are used to set up this instrument, but it is possible to set up with micrometers.

Low Water Alarm Valves and Seats

The tools shown in the illustration for reconditioning valves and valve seats on low water alarm are hand tools, operated with a wrench and screw driver. The valve-seating tools which are shown at the right are made up of a brass nut which is screwed on in place of the regular gland nut. This nut is tapped to receive the feed screw which carries the counterbore and is made up of one piece of carbon tool steel. The tool has a pilot 13/64-in. in diameter by ⅝-in. long, a 45-deg. cutting face 3-64-in. wide, and a flat or 90-deg. cutting face ⅜-in. in diameter.

The tool for facing the valve is made up of a ¾-in. square piece of steel 1¾-in. long, with a $\frac{3}{16}$-in. hole through the center to support the stem of the valve. The hole is countersunk to receive the valve, and a tool-steel blade inserted and held by a filister-head machine screw. A chip chamber is milled out in front of the cutter.

In operation, the valve is inserted in the tool and given



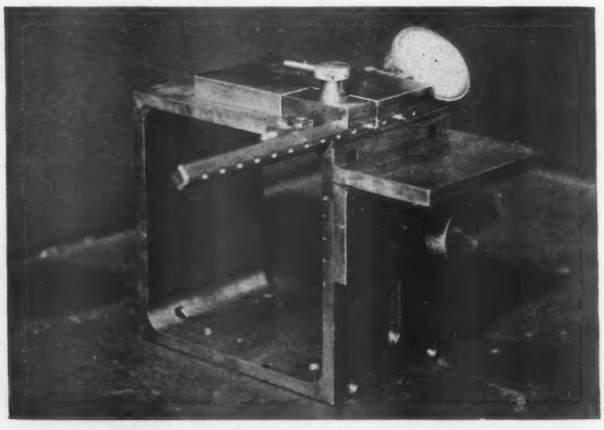
Top view showing the use of the tap-lead checking gage

a few turns to the right at the same time pressure is being exerted on the screw driver. The valve is then in good condition to grind.

Two sets of tools are shown in the illustration placed in different positions so as to give a clearer idea of their design.

Drilling Crosshead Centers

The jig for drilling crosshead centers is made in two parts and held on the crosshead by a long bolt which passes through the crosshead. Both parts are identical,



Gage for conveniently and accurately checking tap lead

with the exception that one is right-hand and the other is left-hand. They are made of soft steel forgings, 1-in. thick, finished, with three ledges. The top one is provided with four hardened tool steel drill bushings and is ¼-in. above the crosshead. The second and third ledges are spaced far enough apart to allow a slip fit for the shoe fit in the crosshead; the third ledge also has a set of drill

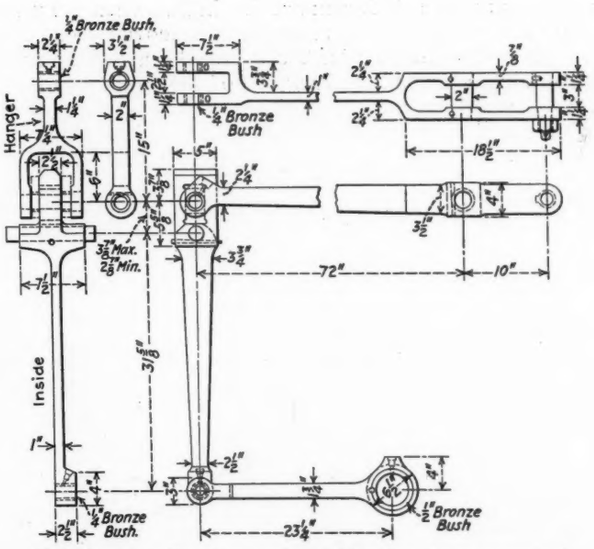
bushings that correspond with those in the top ledge. These keep the drill from running off while drilling the second side of the crosshead. The projected sides serve as parallels to hold the crosshead square with the drill.

Straps welded in the ends of the first and second ledges make a stop that comes in contact with the front end of the crosshead center which has been machined. This style of drill jig for crosshead centers has been used at Roanoke shops for the past five years and is giving exceptional service.

Variable Lead Attachment

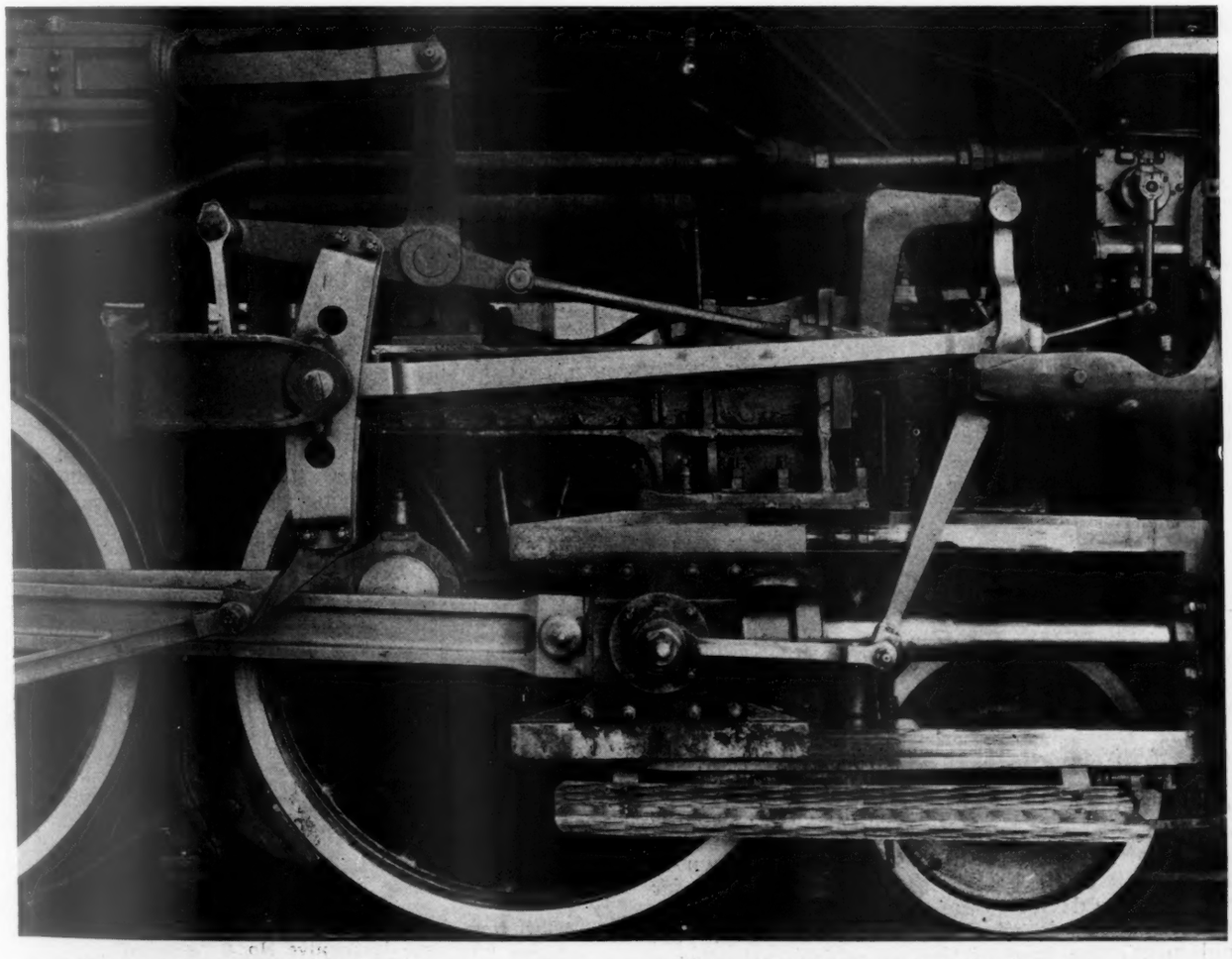
A VARIABLE lead attachment for use in connection with Walschaert valve gears is being tested on Denver & Rio Grande Western locomotives under the direction of W. J. O'Neill, general mechanical superintendent. The principle of this design is to give a variable lead by automatically changing the working proportions of the combination lever, depending upon the position of the reverse lever. The design is covered by a patent which has expired.

Referring to the illustrations, the construction will be clear. The upper end of the combination lever is slotted to provide for movement of a block, similar to the ordinary link and block, which is carried therein.



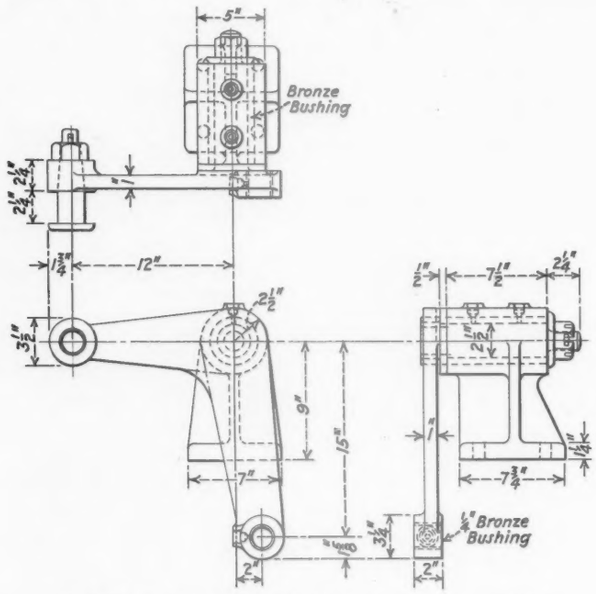
Details of radius bar and combination lever arranged to give variable lead

The front end of the radius bar, connected by a pin through this block, is supported by a hanger from the horizontal arm of a rocker, the vertical arm of which is connected by a short reach rod to an auxiliary arm on the reverse shaft. The short reach rod and the



Denver & Rio Grande Western locomotive equipped with variable lead attachment for Walschaert valve gears

auxiliary reverse shaft arm are line in line when the gear is on center. As the reverse lever is moved from the center to the front or back corners, the auxiliary arm swings in an arc and the back end of the auxiliary reach rod is moved back, thereby moving the rocker and lowering the block in the top end of the combination lever,



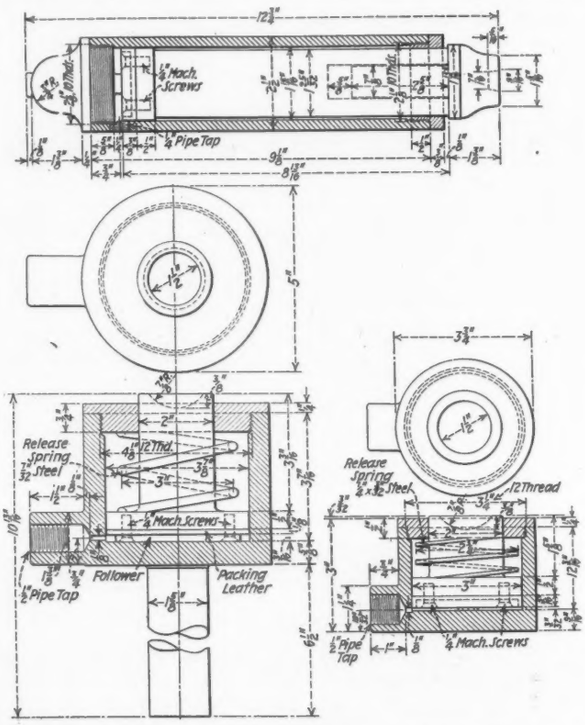
Details of the lead-changer rocker arm and box

thus changing the proportions of the combination lever and, therefore, the lead. On the locomotives in question this gives 3/8-in. lead at 25 per cent cut-off and zero lead in full gear.

The top end of the combination lever is hardened and the block which moves in this slot is of hard bronze. The total maximum movement is only one inch and, with this design, good wearing qualities and service are secured. The advantage gained by the variable lead attachment is the line and line setting of the valves in full gear, producing a greater starting power in the locomotive and a longer lead at short cut-off, which gives a larger port opening and a more sustained period of admission for the steam. Depending upon the position of the reverse lever, variable lead is obtained by automatically changing the working proportions of the combination lever.

piston. The air pressure causes the set to raise against the compression of a spring. This holder-on is provided with a handle 1 5/8-in. in diameter and 6½-in. long.

The holder-on shown in the lower right of the drawing is of the same design, except that it has no handle. Both of these holders-on can be used to advantage in various locations when driving rivets in a locomotive boiler or tender tank. The holder-



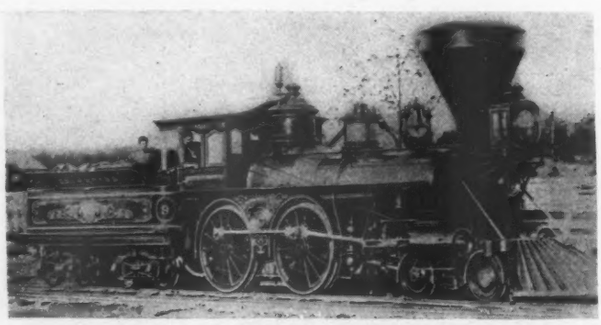
Three designs of holders-on operated with compressed air

on shown at the top of the drawing operates on the same principle, except that the sets are detachable from the piston. The long casing also affords a better grip for the bucker-up on outside work. This holder-on can be used to advantage in both car and boiler shop work, especially in riveting up mud rings. Sets can be made interchangeable for this holder-on by having the shank of each set machined to fit the 7/8-in. hole in the piston. The cushion of compressed air underneath the set serves to absorb the vibration, thus relieving the man who does the bucking-up for the riveter.

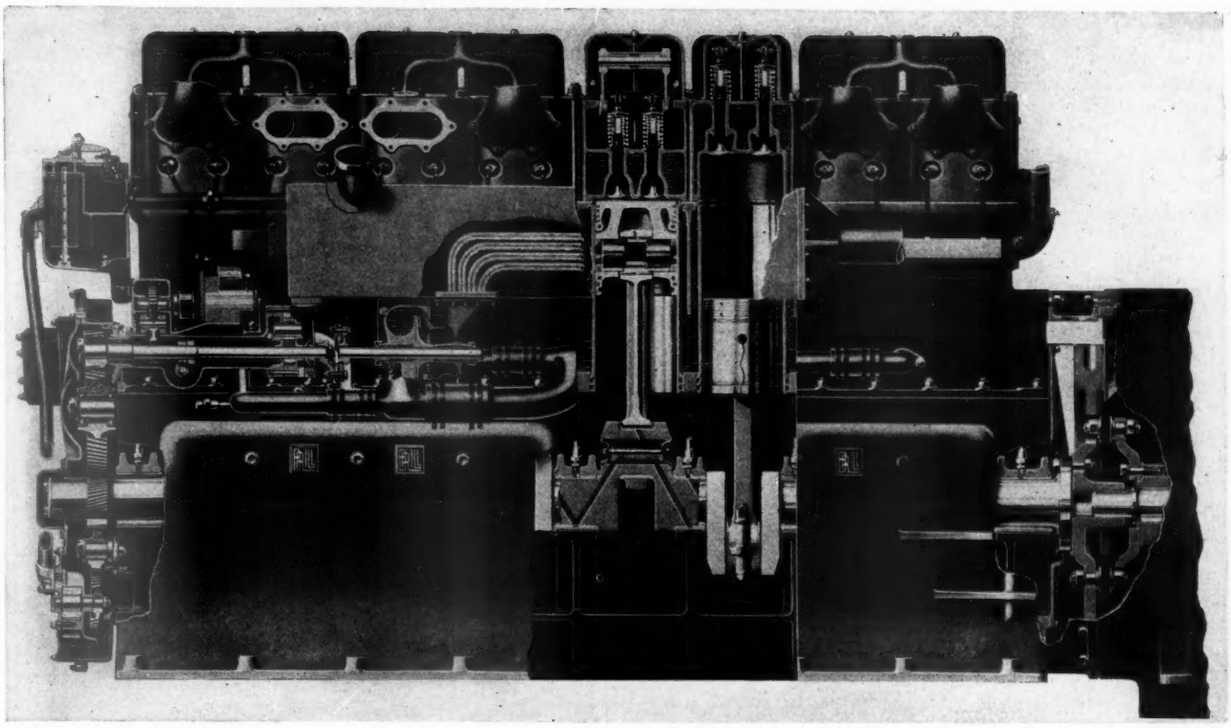
* * *

Holders-On for the Car and Boiler Shop

THREE designs of holders-on for bucking-up rivets are shown in the drawing. The operation of all three is essentially the same; namely, that the vibration is absorbed by means of a cushion of compressed air. Referring to the holders-on shown in the lower left of the drawing, provision is made for attaching the device to the shop air line at the ½-in. pipe tap. Air is admitted through a 1/8-in. port underneath the base of the set which serves as a



Louisville, New Albany & Chicago (Now part of the C. I. & L.) 4-4-0 type locomotive No. 9 "Admiral" built by Hinkley



Sectional elevation of the eight-cylinder engine

Brill Rail-Car Engine Develops 535 Hp.

Has eight cylinders and normal speed of 950 r.p.m.— Electrical load controlled by engine speed— Auxiliaries separately driven

THE J. G. Brill Company, Philadelphia, Pa., has developed and is now offering for sale two completely new power plants, one rated at 400 hp. and the other at 535 hp. The engines are of identical design and size, except that the smaller one is a six-cylinder unit and the larger an eight-cylinder in-line unit. Likewise, the electrical equipment, which has been specially designed to operate with these engines in co-operation with the engineers of the General Electric Company and the Westinghouse Electric & Manufacturing Company, is identical as to type, control arrangements, etc., for both engines, differing only in size. The eight-cylinder equipment, will, therefore, be illustrated and described, it being understood that differences are only those which might be expected by reason of the lesser number of cylinders in the smaller plant and the difference in size of transmission equipment, radiators, fuel tanks, etc., to correspond with the smaller horsepower.

In addition to the main engine, a small automotive-type four-cylinder engine of 15 hp. capacity is used to drive a 32-40-volt generator, having a continuous rating of 7.5 kw. for battery charging, excitation, lights, air-compressor operation, etc. When considering the complete car, therefore, the actual horsepower installed is, respectively, 415 and 550.

The main engines have been completely designed by the Brill organization and embody all the well-known features characteristic of previous Brill engines and, in addition, numerous developments and improvements which are the result of experience in the field. They are of 8¾-in. bore and 10½-in. stroke, designed for a normal speed of 950 r.p.m. The piston displacement of the six is 3,788 cu. in., while that of the eight is 5.051 cu. in. These engines weigh 8,000 lb. and 10,000 lb., respectively. The rated horsepower represents a brake mean effective pressure of about 87 lb., which is well below the maximum that can be obtained. It is expected that new engines on test will develop at least 10 per cent above the rated power. This follows previous Brill practice and, as a result of this de-rating, it is expected that these engines can be operated at full

rated horsepower whenever desired throughout their life.

The base is an internally-ribbed aluminum-alloy casting, in one piece, and combines what would ordinarily be known as the crankcase, oil pan and bedplate, extending from the flange on which the engine is mounted to the bottom of the cylinder block. The crankshaft is supported in this base and can be removed through the top by removing the cylinder block and end covers. This base also carries an integral semi-bell housing at the rear end, to which the electric generator is attached. The generator is driven by the engine through a flexible steel-disc coupling. The forward end of the armature shaft is piloted in the flywheel, the generator being of the single-bearing type. The cylinder block, which is also in one piece, bolts to the top of the base and when in place gives a combined depth of 52 in., these two parts together forming an extremely rigid and substantial support for the crankshaft. By reference to the cross-section of the engine it will be noted that the base includes ribs adjacent to the main bearings on either side which transfer the stress directly from the main bearings to the cylinder block, avoiding any possible bending strains in the crankcase and base castings such as are commonly encountered in a base-mounted crankshaft. Convenient hand-hole openings are provided on both sides of the base for inspection or adjustment of bearings, and all exterior apparatus is so arranged as to avoid interference with these openings.

The cylinder liners are of the removable type and are of nickel-chrome cast iron, heat treated, machined all over and ground to size. Two rubber seal rings are used around the bottom of the sleeve to prevent water leaks.

The cylinder heads, which are cast as individual units, one per cylinder, include a novel combustion chamber and valve arrangement for which patent application is pending. As in previous Brill engines, two intake and two exhaust valves are used, these having an outside diameter of 2¾-in. and a throat diameter of 2½-in., with 9/16-in. stems operating in removable guides. The exhaust-valve guides are of aluminum bronze.

Four relatively small valves are used per cylinder in preference to two large valves, because of the better cooling of valves with consequent longer life of valves and valve seats, less noise and decreased detonation. Past experience has demonstrated that in engines of large size, seat and valve life is more than doubled in this way.

The head is so designed that the combustion chamber is concentrated on one side under the exhaust valves, while the other side of the head, which includes intake valves, has a very limited clearance over the top of the piston. In this way the advantages of the high-turbulence type of head, as now commonly used on automobiles, are obtained without at the same time losing the advantages inherent in a four-valve overhead valve design. It is expected that this head will materially reduce the tendency to detonation, give improved efficiency, reduce the fuel consumption, eliminate slow burning or after burning of the fuel, and will decrease the amount of spark advance necessary. It also makes possible satisfactory ignition with two plugs, whereas three or four have heretofore been found necessary even in engines of somewhat smaller size.

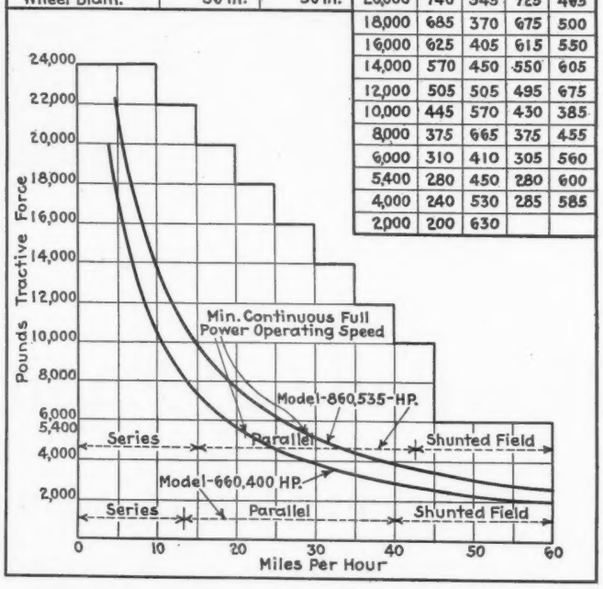
The cylinder heads are cast of high-nickel-chrome iron, rough machined, annealed and finally finish machined. Two entirely separate exhaust ports are provided, one per exhaust valve. Water passages are so arranged that water is forced around the spark plugs, exhaust valves and exhaust ports. The bronze guides, to which reference has already been made, are expected to aid materially in cooling the exhaust valves. The cylinder heads are completely interchangeable.

The pistons are of the Butler patented constant-clearance nickel-aluminum type, similar to those used in all Brill engines for the past eight years, fitted with five cast-iron rings 5/16-in. wide, three compression and one drain-oil ring above the piston pin and one oil-distributing ring at the bottom of the skirt. The piston pin is of a floating design and is secured by suitable keepers fitting into the piston.

The crankshaft is a high-carbon hammered forging, fully heat treated, machined all over and balanced. All

Engine Model	No. 660	No. 860
Horsepower	400	535
Gear Ratio	56-20	56-20
Wheel Diam.	36 in.	36 in.

Tractive Force	400 HP. Amps.	400 HP. Volts	535 HP. Amps.	535 HP. Volts
22,000			780	430
20,000	740	345	725	465
18,000	685	370	675	500
16,000	625	405	615	550
14,000	570	450	550	605
12,000	505	505	495	675
10,000	445	570	430	385
8,000	375	665	375	455
6,000	310	410	305	560
5,400	280	450	280	600
4,000	240	530	285	585
2,000	200	630		



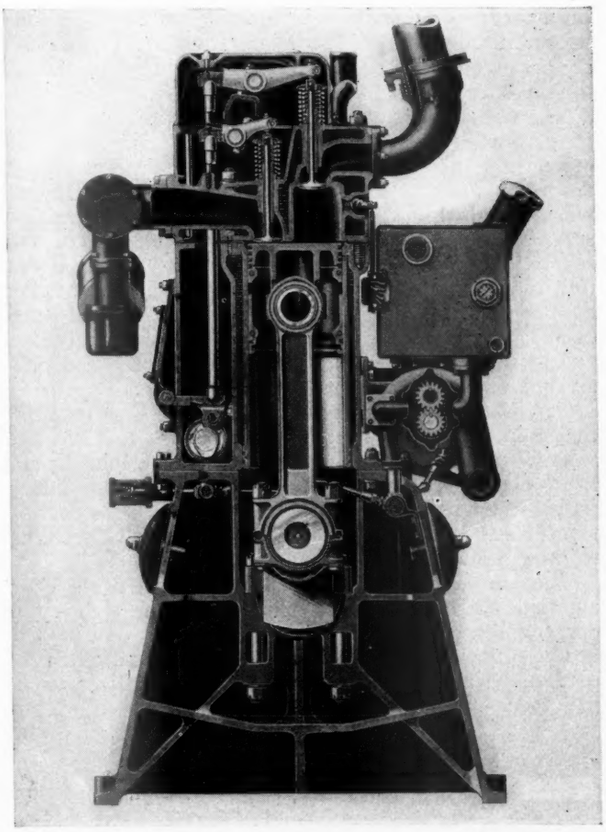
Speed-tractive-force curves for the Brill six- and eight-cylinder engines

main bearings are 5¼-in. in diameter, all crank-pin bearings 5 in. in diameter, and the cheeks 2⅛-in. by 6½-in. The front and center bearings are 5 in. long, the rear bearing 6 in., and all other main bearings 3½ in. The connecting-rod bearings are 3⅝ in. long. Both main and connecting-rod bearings are arranged with the babbitt in the cap spun directly into the high-carbon forged-steel caps, while the opposite half of the bearing is a babbitt-lined, bronze-backed shell, having a total thickness of ½ in. As the babbitt lining of the cap half is comparatively thin, the ends of the bronze-backed shell abut the cap at the joint and are thus securely anchored without resort to dowels, screws or rivets. Thus the entire bearing surface can be kept fully round and free from grooves or reliefs of any kind, except that the main bearings are provided with circular grooves which serve as a passage from the oil leads through the drilled crankshaft to the connecting rods. This bearing construction is such that it is possible to remove any bearing without disturbing the crankshaft. It is expected that the elimination of the dowels will result in a marked improvement in bearing life.

The connecting rods are of high-carbon, heat-treated,

drop-forged steel of I-beam section, fitted with two nickel-steel bolts for securing cap and crank-pin bearing. They are bushed at the upper end for 3½-in. diameter piston pins of the conventional tubular, case-hardened and ground design.

The valve arrangement makes it possible to operate both intake and exhaust valves from a single camshaft, having nine main bearings, which is located at the base of the cylinder block. Each cam, through a rocker-type follower, operates a tubular push rod, which is fitted to a suitable rocker arm located on the cylinder head. The camshaft is supported in nine main bearings, 3¼ in. in diameter, each 2½ in. long, except the front bearing which is 4½ in. A small spring is provided between the rocker-type cam follower and a collar on the push rod, so that all clearance is concentrated at this point, materially reducing valve noise. The camshaft is mounted in a tunnel or trough, so arranged that the cams continually dip in oil. The cam and cam rollers are of low-carbon, double-quenched, carbonized alloy steel. The cam rollers are 2 in. in diameter by 1 in. face.



Cross-section of the Brill rail-car engine

Ignition is provided by two independent, interchangeable, high-tension Scintilla magnetos, each fitted with an impulse coupling. Four 2½-in. carburetors are used, opening into the intake manifold located on the right side of the engine, while the exhaust is handled through eight independent vertical exhaust pipes discharging into a muffler built on the roof. It is believed that the use of a separate exhaust stack for each cylinder is a distinct advantage. Rail-car engines, particularly in these larger sizes, operate at a high power factor and where two or more cylinders are served by the same exhaust manifold, it is very difficult to avoid trouble with manifold castings, gaskets and joints.

The oiling system, while generally similar to that used in previous Brill designs, represents a development. Oil is carried in a 30-gallon tank mounted on the exhaust side of the engine above the water and oil-pressure pumps. The level of oil in this tank is indicated by a float-type gage. Oil is drawn from this tank through the gear-type pressure pump, whence it is delivered to an oil manifold running the length of the engine inside the base on the exhaust side. From this point the oil is fed to every alternate main bearing. The crank-shaft is completely drilled for oil passage from end to end. Connections are taken from the remaining main bearings to a low-pressure manifold running the length of the engine beneath the cam-shaft. From this manifold, which is secured by hollow cap-screws, oil is fed by suitable passages to the camshaft bearings, thence through copper tubing and connections to the rocker-arm mechanism on the cylinder heads. The push-rod ends of the rocker arms are drilled, carrying oil to the top of the push rod whence it runs down to the valve rocker and into the trough surrounding the camshaft, the overflow draining back to the sump. Cylinder walls and wrist pins are lubricated by spray from the main and connecting rod bearings. The crank pins are drilled, giving a 2-in. diameter reservoir in each crank pin. This reservoir is useful in starting a cold engine, in that oil is immediately available at the bearings without waiting for pump pressure to build up. Oil then drains to the sump, whence it flows to the bottom of the gear case at the front of the engine and is picked up by a scavenger pump, which delivers it to the Hall-Winslow type filter built into the engine, thence back to the storage tank. A suitable oil-pressure regulating valve is fitted. Water from the radiators is drawn through a heat interchanger in the oil tank to the water pump, in this way maintaining the correct oil temperature.

The timing train consists of four main gears. These are of the helical type, having a 2¼-in. face and a normal diametral pitch of 7. In addition to the above gears, two lighter gears are arranged to drive the scavenger pump and another set of small gears drives the magnetos from the accessory shaft.

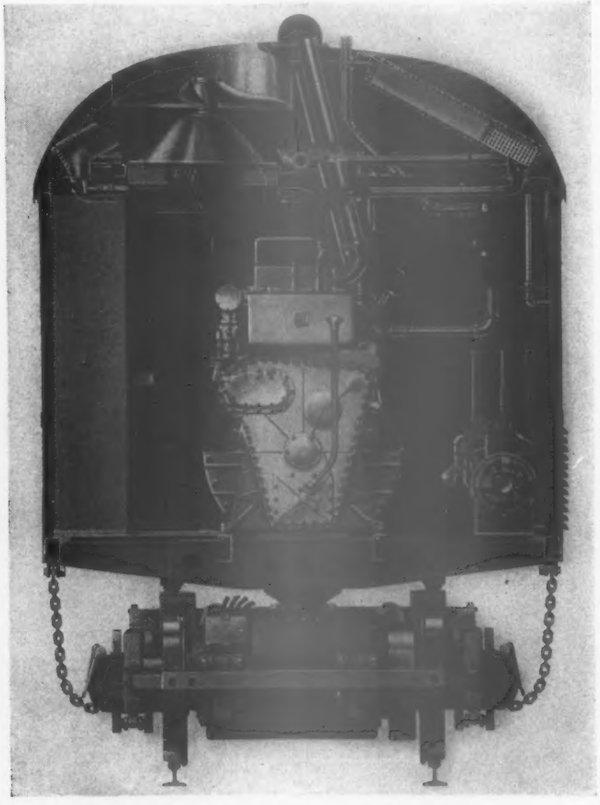
The cooling system is generally similar to that used in recent Brill designs and is so arranged that whenever the engine is shut down the water is drained inside the car, leaving the radiators dry and thus preventing freezing. With the engine not running, surplus water is accumulated in the expansion tank. When the engine is running this water is drawn by the pump through the oil cooler in the oil tank and delivered to the engine, thence to the cross-flow radiators located in the roof, from which it returns to the suction side of the pump.

The water pump has a capacity at the rated speed of the engine of 240 gal. per min. Air is drawn through the radiators by two electrically-driven constant-lead cast-aluminum fans, 40 in. in diameter. These fan motors may be operated either in series or in parallel, depending on the cooling requirements. The cooling system is so designed as to give satisfactory cooling regardless of speed or direction of car movement or prevailing direction of the wind. The partial vacuum created between the radiators and the fan causes air to be drawn from the engineroom through the shrouds surrounding the exhaust pipes, thus providing for engineroom ventilation and also cooling the exhaust pipes. The air from the fans is discharged vertically immedi-

ately back of the muffler, so that the exhaust gases are carried into the air, thus preventing their reaching the interior of the car body.

The fuel is carried in suitable tanks beneath the car, from which it is fed by vacuum tanks operated by a vacuum pump driven from the main engine. These vacuum tanks are in duplicate to prevent tie-up of the equipment in case of failure of either tank.

A variable-speed governor is provided. The hand throttle at the operator's position controls the maximum opening of the carburetor throttle, in addition to controlling the operating speed of the engine through the governor. This governor, in turn, through an oil relay operates a rheostat or controller in the field of the gen-



Diagrammatic illustration of the cooling system

erator in such a way that if the engine speed rises the load is increased and vice versa. Thus it is possible for any desired engine operating speed to get the best combination of throttle opening and load consistent with smooth operation of the engine and maximum fuel economy. This feature is also the subject of a patent application.

The electrical equipment consists of two groups. The high-voltage, or 600-volt, group consists of a shunt-wound generator driven by the main engine, with the field regulated by the governor; suitable traction motors and control apparatus consisting of a small master controller which governs motor connections (i.e. forward or reverse, and series, parallel or shunt-field arrangement of traction motors), together with the necessary switches and contactors. The fan motors and a 25-cu. ft. high-voltage air compressor are included in this group. There is no exciter attached to the main generator.

The low-voltage group consists of the small four-cylinder automotive-type industrial engine, which drives a 32-40-volt generator mounted as a unit with it; the 32-volt battery; a 25-cu. ft., 32-volt air compressor, and the necessary apparatus for control. The field of this generator is varied by a Safety Car Heating & Lighting Company's generator regulator, so as to maintain the voltage of the small set substantially constant. This insures charging the battery at the proper rate regardless of its condition, in addition to carrying compressor, lights, or rather 32-volt loads, as necessary, without any danger of over-charging the battery. It is believed that this arrangement will contribute materially to the reliability of the apparatus and particularly to the life of the battery. Furthermore this small set can be operated at any time, whether or not the large plant is operating, making it possible to shut down the large engine completely in coasting down grade. Also the small plant can be used for charging the air system before starting the main engine and for re-charging the batteries at terminals if for any reason this should become necessary. Both the large and small generators are arranged with suitable starting windings for starting their respective engines.

The use of the small engine provides a second source of current for starting the main engine; i.e., the main engine can normally be started from the battery, or from the auxiliary set, although the usual procedure would be to draw from the battery with the auxiliary set assisting. The small set also provides a constant source of air without making it necessary for the operator, in descending long grades, to disconnect the traction motors and speed up the main engine, as has been necessary with the conventional equipments heretofore.

The small auxiliary set also improves the economy, as the fuel consumption necessary for handling accessories, is far less than would be required for operating the main engine for that purpose.

Since the load on the main engine is determined purely by engine speed and not by any limitations of electrical design within the usual car speeds, it is possible to utilize the full power of the engine at car speeds up to 60 miles an hour.

The curves illustrate the speed-tractive-force characteristics of both the six-cylinder and the eight-cylinder engines.

These new and larger power plants are an extension to the line and will not supersede smaller sizes which have been used for the past several years.

* * *

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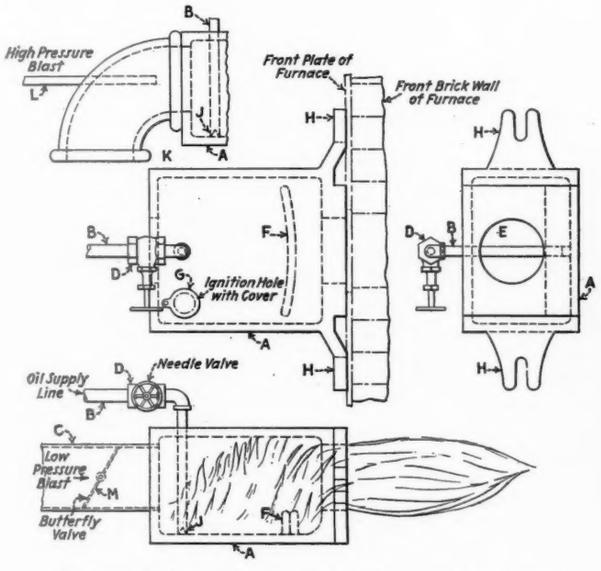
Oil Burner for Smith Shop Furnace

By Frank P. Deissler
Blacksmith Foreman, Bessemer & Lake Erie

THE drawing is of a burner which has been applied to a variety of general- and special-purpose furnaces used in the blacksmith shop of the Bessemer & Lake Erie at Greenville, Pa. It is of simple construction consisting essentially of a grey-iron body casting *A* with suitable pipe connections for the blast and oil supply lines. The casting is secured to the brick wall of the furnace by means of bolts extending through the lugs *H*.



Burner designed for use with either high or low pressure blast

Fuel oil is supplied through the pipe *B* and is regulated by the needle valve *D*. The fuel supply pipe extends to the bottom of the burner and the end is notched as shown at *J*. A fin *F* is cast on the bottom of the burner as shown in the drawing, the top of which is at approximately the same height as the bottom of the burner hole *E* which leads directly into the furnace.

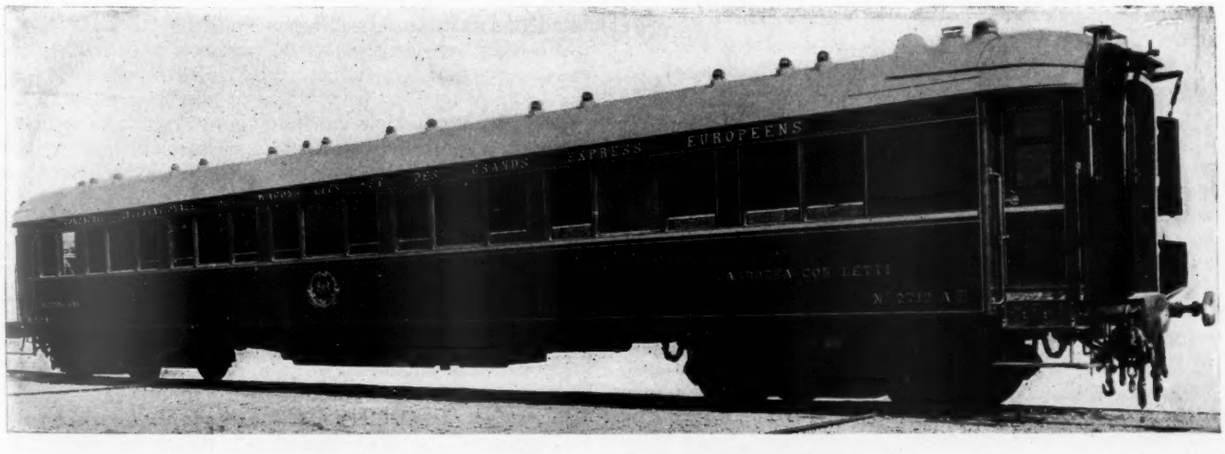
The burner can be used with either low or high-pressure blast. The connections for the high-pressure blast are shown in the upper left-hand corner of the drawing. The pipe *L* is connected directly to the shop airline. The low-pressure blast pipe is fitted with a butterfly valve *M*. The position of this valve, with the burner in operation, is regulated by means of an adjustable counter weight which is carried on an extension of the butterfly-valve shaft, bent 90 deg. to the shaft and parallel to the pipe *C*.

Oxy-Acetylene Wagon

THE customary oxy-acetylene welding wagon is usually difficult to move about over the ground in a car repair yard. The illustration shows a wagon which was made by shortening a Ford axle to 26 in. between the hubs and bolting the wheel spindles to the axle, thus making a rigid straight axle. The two wheels are equipped with 30-in. by 3-in. pnaumatic tires, and will not pack the snow like steel wheels.

Rubber-tired oxy-acetylene wagon which can be readily moved by one man

* * *



International sleeping car in service on the Italian State Railways

The Reader's Page

There Is a Future with the Railroads!

BELLEVUE, PA.

TO THE EDITOR:

Your editorial, "Is There a Future with the Railroads?", in the April issue and the subsequent discussion on the subject have proved of utmost interest to the younger men of the railroad industry, and especially so to the recent technical graduates who are serving special apprenticeships or who have just completed them.

The technical graduate must accept his apprenticeship on equal footing with the non-technical man and forge ahead as rapidly as his educational advantages will permit. It goes without saying that he must don overalls and learn to set valves, lay off frames and shoes and wedges, and to do steam pipe, superheater unit, rod, wheel, frame and all other fundamental locomotive construction and maintenance work before he can rightfully claim any chance to supervise men who know how to do these things. A technical education helps mightily in forming a foundation for such work, but one cannot emphasize strongly enough the amount of hard work that the building of such a foundation entails.

The regular apprentices know of the advantages of a technical education and you find many of them studying long and earnestly at night schools and with correspondence schools, or working hard under capable apprentice instructors on roads which have highly developed apprentice systems. The technical man finds plenty of competition among the capable young fellows who have not had the same educational advantages, but who are making the most of all the opportunities which present themselves. It is not likely that the technical man would be willing to do the hardest and most disagreeable work in the railroad industry, nor would the regular apprentice work equally as hard during the day and study at night under the most adverse conditions, if he did not believe that there was a future for him with the railroads.

Recent developments in the railroad industry, such as the introduction of new power, increasing the efficiency of old power; the introduction of advanced methods in shop and stores accounting; new methods of shop routing, shop scheduling and shop production; and new devices, such as automatic train control, roller journal bearings, etc., all require the services of skilled men of exceptional ability. There are tremendous opportunities for the younger men in the railroad game if they are willing to apply themselves, and they will find that the return from their work will be directly proportional to what they put into it. The educational advantages, combined with hard work, are apt to send the younger men far in their chosen field of work, whether it be in the railroad industry or any other.

In answer, then, to your editorial, it remains to say that beyond any doubt there is a future with the railroads for the younger men who are willing to apply themselves.

W. J. HARGEST,
Piecework Inspector, Pittsburgh & Lake Erie.

A Hint to Railway Stockholders

CHICAGO.

TO THE EDITOR:

Your editorial, "Shaking Them Up," in the July issue of the *Railway Mechanical Engineer* is instructive, contains wholesome facts, and I hope that the presidents of some of our railways have carefully read it.

How can stockholders hope for fair dividends to continue when employees know that the head of their department is not loyal to them? Loyalty on the part of the railway president and his superintendent begets loyalty in the employee, and a loyal employee will always give a good, honest day's work to the railway company.

The last two sentences of "Shaking Them Up" are golden; viz. "We cannot, however, overlook the fact that there are still officers in control of some of these departments ignorant of the true nature of loyalty and who still act on the belief that fear is the most effective motive by which men may be spurred to their utmost activity. No intelligent man should risk his future where such a belief prevails."

It is a sad fact that there are now in railway service presidents who encourage their department heads in "shaking them up," being too ignorant in the art of handling men to get results by any other method. While I am not now in railroad work, I have had twenty years of active railroad experience and know what you say to be true.

Bearing out my statement, the following is one recent incident wherein the railway employee concerned was thoroughly educated, of wide practical railroad experience, congenial, courteous and loyal. He had been in the employ of the X Y Railway continuously for ten years, during which he had gone out and worked through several strikes; he was a conscientious worker, secured good results and was well liked by his fellow employees. But he made *one mistake* and that was working for a railroad which had a department head who was disloyal to his employees and used sharp practices in dealing with them. He would take a personal dislike to an employee and was too cowardly to have a heart-to-heart talk with the employee, but would order one of his subordinate officers to write a note to him: "After such and such a date your position will be abolished," or "Your services will not be required after such a date." He did not offer him another position or give any real reason for the discharge. The result was this employee was ruined so far as railroad

work was concerned, as no other railroad would employ him.

The moral is that such cowardly action on the part of the X Y Railway's officer (apparently sanctioned by the president) is not going to bring young, ambitious college graduates into the ranks of its employees. Incidents similar in nature to that mentioned will soon become widely known, and then the X Y Railway will have no alternative but to accept uneducated scrubs as employees. The final result, the destruction of loyalty, is accompanied by a loss of efficiency, and a lowered efficiency ultimately leads to an undesirable increase in expense and consequent smaller dividends to the unfortunate holder of X Y Railway Company stock.

Had this man fitted himself for a lawyer, doctor, or for the mercantile business, in ten years he would have built up a clientele of substantial friends whose good will would have been worth many thousands of dollars. But he fitted himself for railroad work; the friends he made were railroad men, and their good will had (as usual) no monetary value.

Any young man in choosing a profession should be careful to consider well other professions before making his final decision to take up railroading.

A RAILWAY STOCKHOLDER.

A Future in Railroading? A College Man's Answer

BELLEFONTAINE, OHIO.

TO THE EDITOR:

The editorial, "Where Does the College Man Come In?", which appeared in the August, 1929, issue, sums up as clearly and exactly the present position of the college graduate in mechanical department work as anything I have ever read. No college teaches the practical side of railroading. One has to get his training by practical experience obtained through actual work in the shops and engine terminals. Such being the case the college graduate is no better off than the non-college man, except that his theoretical education has, perhaps, taught him to use his brains to better advantage. Therefore, I believe that the railroads have, either through their own ignorance or ultra-conservative personnel policies, stumbled onto a more intelligent use of the younger man than many manufacturing and public utility companies that have followed for many years the practice of culling the graduating classes of technical schools for the "cream" or "promising students."

I graduated from college in mechanical engineering a comparatively few years ago. I do not consider myself a local success, neither will I admit that I am a failure. For that reason, I do not feel qualified to propound wisdom for discouraged college men in railroad work. I know of some college men who are not so good, and I also know some non-college men who are a darned-sight better. Ability to handle men and to use judgment in supervising your department is of more value to the railroad company, except perhaps in the mechanical engineer's office, than knowledge of calculus, mechanical and laboratory tests. An aptitude for doing what you are told when you are told to do it—even in the face of personal, social or business engagements—is what the "old man" wants. He will not stand for any excuses or delays.

It is in meeting demands such as these that many non-college men will have an advantage over the college man. The latter is not crazy about working in all conditions of weather, neither does he like to work nights and holidays, all of which appears to be an inherent part of railroad work. College education does not tend to make such working conditions more enjoyable.

With all this, I would not say that a college education is not helpful in railroad work. This question has been discussed a number of times in your editorial pages and also by a number of your readers, so there is no need to talk about the advantages of a college education further.

There are several things, however, that I do not like with respect to the future of the young man in the railroad industry. One of these is the trend toward mergers. The principal argument for mergers is to obtain more economical operation. Wages is one of the largest items of expense in the operation of any company. Large corporations lack souls, and we smaller fry have little or no opportunity to show what we can do. The man who actually directs our destinies is far, far away. He cannot take any time to get acquainted with the younger fellows and expect to keep up with his golf. Mergers mean fewer executive positions and less opportunity for us. The "key men" get the big money while the rest of us have to struggle along on barely a living salary.

There has been little encouragement in recent years for college men or, in fact, any other type of men, to follow railroad work as a career. Few of us inherit the "swift kick in the pants," to help us up the ladder, as John Coolidge will undoubtedly receive, and as I know a considerable number of our present railway executives got in their youth. Nevertheless, more college men are making places for themselves in railway work today than were doing so in previous years. Will that be true ten years from now?

A. T. E.

Called to Account for an Error

GALVESTON, TEXAS.

TO THE EDITOR:

The following statement appears in the first paragraph of the article on page 547 in the September issue, describing the Reading 2-10-2 type locomotives: "The total weight is 439,900 lb, which is believed to be the heaviest weight of any locomotive of the 2-10-2 type ever built." The writer of that article evidently does not read his *Railway Mechanical Engineer* very carefully. In the table on page 477 of the August issue showing examples of recent freight locomotives of the 2-10-2 type, I note that the weight of the Baltimore & Ohio, Class S 1 A, is 440,340 lb.

WM. T. HOECKER.

[Mr. Hoecker is correct. The Baltimore & Ohio 2-10-2 type locomotive is 440 lb. heavier than the Reading 2-10-2 type.—EDITOR.]

FIREBOND.—A booklet containing some new and useful tables for calculating the quantities of brick required for arches of different spans and thicknesses has been issued by the Harbison-Walker Refractories Company, Pittsburgh, Pa. The booklet describes Firebond and the advantages which may be obtained by its use in annealing ovens and furnaces, boiler settings, electric-steel furnaces, enameling furnaces, soaking pits, etc.

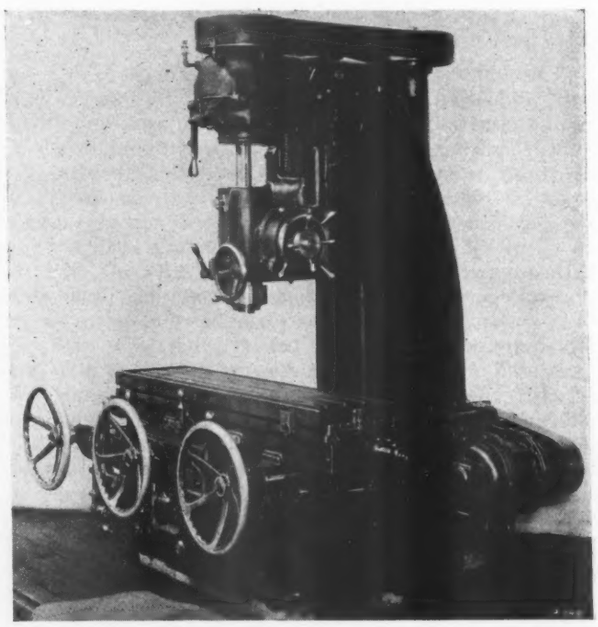
Reed-Prentice No. 5 Vertical Miller

ONE of the recent additions to the line of machine tools manufactured by the Reed-Prentice Corporation, Worcester, Mass., is the Model No. 5 vertical milling machine shown in the illustration. The outstanding features of this machine are power rapid traverse in either direction, cross or longitudinal, and Timken mounting of all main bearings including Precision Timken bearings for the spindle.

This machine has a longitudinal power feed of 48 in., a cross power feed of 16 in., and a vertical spindle feed of 9 in. The rapid power traverse is operative in either direction at the rate of 100 in. per minute for both longitudinal and cross feed. The spindle has 18 speeds ranging from 17 to 600 r.p.m. The feed range for 18 speeds is .002 to .297.

The cast-iron parts of the machine are manufactured from a cast iron made up of about 20 per cent steel. The base is of box section reinforced and webbed to provide the greatest rigidity. The column is also of box section amply reinforced and webbed. The saddle supports the table for its full length and has a four-bearing mounting on the base, all surfaces being accurately scraped. Longitudinal and cross-feed screws are of vanadium steel with lapped threads. The feed screw nuts are of special alloy phospher bronze. Both the cross and longitudinal feed screws are mounted on Timken Precision bearings. One Timken bearing at each end of the screw insures the screw being alined in tension, and absorbs both the radial and thrust loads. This is said to be a new practice in milling machine table and saddle construction. The saddle has an extra length of dovetail bearing on the base allowing the saddle casting of U-shape to clear the column. The cross slide bearing is 28-¼ in. in length. The saddle-carrying table has power rapid traverse cross movement at the rate of 100 in. a minute. The bearings in the top box are all Timken bearings including the idler for maintaining belt tension. Double back gears of hardened alloy steel running in an oil bath are located in the upper gear box.

The spindle is of heat-treated forged chrome-vanadium steel fitted with a clutch-drive nose and a standard milling machine taper of 3-½ in. per ft. The spindle runs in Precision Timken roller bearings with an adjustment of taking up both radial and thrust loads. This construction allows a metal to metal contact and insures a rigid spindle mounting. The spindle is fitted with a graduated scale and micrometer stop for accurately feeding to a pre-determined depth. The spindle and head are provided with counterweights for easy adjustment. The spindle is also fitted with a slow worm and worm-gear feed operated by hand wheel at the front, or by direct connection at the side through a large spider hand wheel.



A special feature of the No. 5 miller is the power rapid traverse in either direction

The table of the machine is supported its full length on the saddle and has three T-slots with oil channels at the sides and at the end. The table is operated either with regular feeds or a rapid traverse cross and longitudinal feed at the rate of 100 in. a minute.

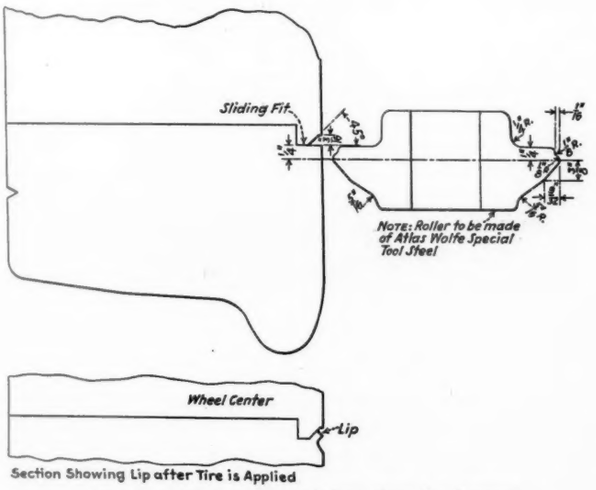
The speed change gears are of hardened nickel-chromium steel mounted on multiple spline shafts run-

ning in Timken bearings. The vertical shaft is driven through spiral bevel gears. All of the speed changes are controlled from the front of the machine.

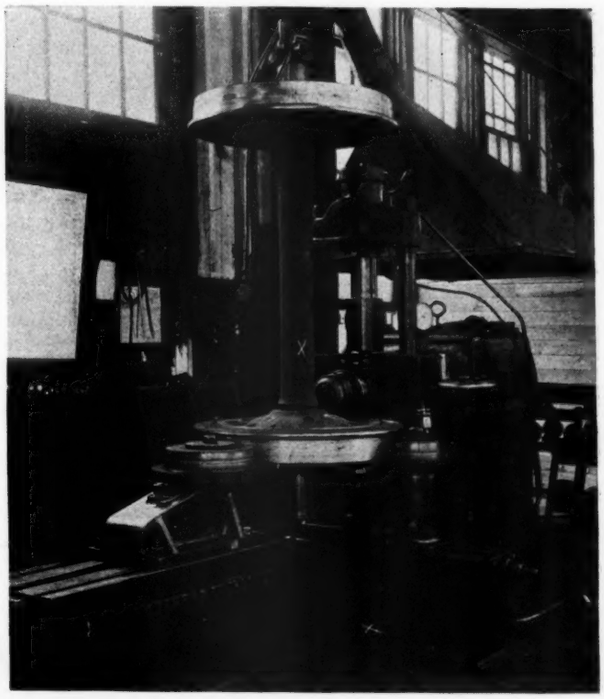
The feed box is a self-contained unit giving eight feeds for each spindle speed having a total range from .002 to .297 in. The feed gears are of heat-treated high manganese steel and run in oil on multiple spline shafts mounted in Timken tapered roller bearings. The safety feed clutch is incorporated in the feed box, eliminating the possibility of accident to the gears or the work. The feed clutch is set for maximum feeds and speeds for the limit of high-speed cutters.

Tire Fixing Machine

A *RETAINING* ring rolling machine manufactured by Henry Berry & Sons, Ltd., England, and used at the Transcona (Winnipeg) shops of the Canadian National for rolling retaining rings on coach wheel tires, is illustrated. The coach-wheel center is machined to leave a shoulder ½ in. wide by 5/16 in. deep, which fits into a corresponding recess on the inside face of the tire. The back edge of this shoulder is bevelled off to an angle of approximately 45 deg. The tire is applied by shrinking in the usual manner. When assembled complete, the wheels are set up on end in the machine on three idler rollers which are adjustable to suit the diameter of the wheel. The lip roller (top) is gear-driven and pressure of approximately 25 tons is applied on this roller hydraulically, by a small oil pump attached to the machine and regulated by a hand wheel located conveniently for the operator. An idler roller, located underneath the wheel, directly below the lip roller, takes the pressure, and the friction of the driven lip roller on top revolves the wheels. A small groove which has previously been machined on the tire 3/16 in. from the inside edge acts as a guide for the roller and the material is gradually forced over onto the bevelled edge of the wheel center. The approximate rolling speed is 17 ft. per min., and the average time is 10 min. per tire. No flat iron retaining rings are required and, therefore, there are no rivet holes to drill or riveting to be done. When removing a worn tire for replacement, it is cut in two with an oxyacetylene torch.



Details of roll and retaining ring lip formed



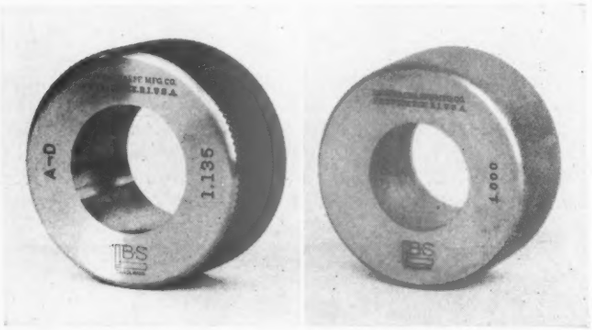
General view of Berry retaining ring rolling machine

Close-up view of retaining ring rolling operation

BALL-BEARING MANUAL.—The second edition of the Gurney ball-bearing manual has been issued by the Gurney Ball Bearing Division of the Marlin-Rockwell Corporation, Jamestown, N. Y. This manual is a condensed handbook for the aid of the engineer in the selection and application of Gurney ball bearings. It is provided with step and alphabetical indexes, which provide a ready reference to each of the fourteen types of ball bearings described. There are 202 pages in this manual on ball bearings.

Brown & Sharpe Plug and Ring Gages

THE Brown & Sharpe Manufacturing Company, Providence, R. I., offers gages conforming in design to the standards specified by the American Gage Design Committee. These are made of the highest grade tool steel, especially selected for the requirements

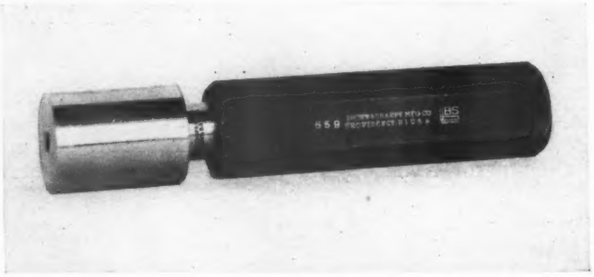


The B. & S. ring gages are made in both "go" and "not-go" types

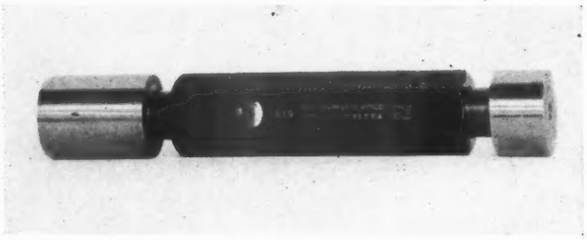
of the work, heat treated, hardened, ground and lapped. The gages are made in both plug and ring types and in both "go" and "not-go" in each style as shown in the illustration.

The plug gages No. 659 are furnished in go and not-go styles and either single or double-end handles may be obtained for use with them. The go gages are easily distinguished from the not-go gages by their longer measuring surfaces. They are furnished in any size or combination of sizes from .241 inch to 1.510 inch. All handles are of hexagonal shape and finished black.

The ring gages No. 664 are furnished in go and not-go styles, in any size or combination of sizes, from .241 inch to 1.510 inch. The smaller rings, ranging in size from .241 inch to .510 inch, are of a two-piece construction with a hardened ground and lapped bushing inserted in a soft gage body The larger rings,



Plug gage with single-end handle



Plug gage with double-end handle

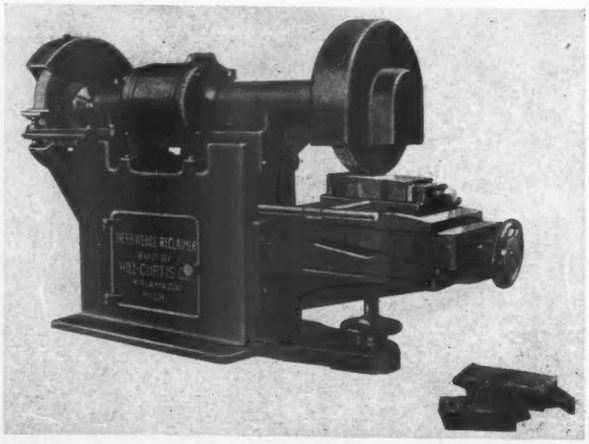
sizes .511 inch to 1.510 inch are of solid stock, hardened, ground and lapped. The not-go gages are easily distinguished from the go gages by the groove running around them as shown in the left view of the illustration in the adjacent coulmns.

F-B Journal Wedge Reclaimer

THE F-B journal wedge reclaimer manufactured by the Hammond Machinery Builders, formerly the Hill-Curtis Company, Kalamazoo, Mich., is a device for accurately and quickly grinding the correct radius on both new and worn car-journal wedges.

The device consists of a profile block, the top of which is machined to the proper radius for journal wedges, and on this machined surface a chuck that will hold all standard A. R. A. wedges is fitted. This chuck is guided under the wheel by means of a feather key which fits in slots planed in the top of the profile block. After one section of the wedge radius is ground the chuck is moved over on the profile block until the feather key in the chuck slides in the next slot. This operation is repeated until as much of the surface of the wedge is ground as is necessary to restore the proper radius.

The amount to be ground from the wedge is controlled by the hand wheel at the extreme right of the machine. This hand wheel operates the screw that



A double-end grinder for reclaiming journal wedges and for general purpose grinding

moves the adjusting block between the profile block and the base of the machine on an inclined way, thereby raising and lowering the wedge in relation to the grinding wheel. The whole wedge reclaiming end of the machine can be raised and lowered to compensate for wear by means of the vertical screw and hand wheel.

The straight-faced wheel on the left end of the machine can be used for general purpose grinding, making the unit both a tool and production grinder as well as a wedge reclaiming machine.

The motor is a 5-hp., 40-deg. Cent. type. It is fully enclosed, having no holes or open slots. A cool operating motor is assured as all the air reaching the motor passes through an air cleaner before it enters the motor windings

An automatic motor starter is mounted in the pedestal, having push-button remote control. This offers maximum protection to both machine and operator, protecting from low voltage, overload, etc.

The spindle is made of nickel steel accurately ground and balanced. Oversize ball bearings, or Timken tapered roller bearings, as preferred, are mounted in end caps in close proximity to the grinding wheels. They are completely enclosed and protected from dust and dirt by double labyrinth seals.

The right end of the machine is fitted with a concave wheel of grade and grain best adapted for grinding journal wedges. The left end is designed for a straight-faced wheel 18 inches by 3 inches for tool and production grinding.

Acetylene Generator Made of Seamless Steel

THE Alexander Milburn Company, Baltimore, Md., has recently placed on the market a portable acetylene generator for welding and cutting which is made in three sizes: namely, 35-lb., 70-lb., and 100-lb. capacities. The generator is unique in that the body is made throughout of drawn seamless steel which makes the generator lighter in weight, stronger and more dependable than bodies with the usual joints.

The generator is simple in construction in that it has no clocks or motors and few moving parts. The carbide-hopper feed control and head are assembled in one unit which can be detached from the seamless steel body by the removal of a few bolts. The carbide feed is controlled by a single valve which responds to high or low pressure and automatically stops if the pressure is at zero, or if the filler plug is open or the generator is not properly closed.

The control and operation of the generator is so simple that the carbide feed is uniform and a complete consumption of the entire charge of carbide is assured.

The Underwriters' Laboratories made tests by tipping the generator at different angles and throwing it over under different stages of operation without causing a rise in the pressure of the gas or abnormal working of the machine.

The machine is equipped with blow-off valves, pressure control and a safety gas purifier and strainer. The component parts of the machine are made with over-size outlets all welded into the seamless body of the generator.

A seamless-steel acetylene generator

The body has a protective coating inside and out. Handles of ample size, welded on to the body, provide for the convenient transportation.

* * *

Eight-wheel switcher remodeled from 4-6-2 type passenger locomotives at the Scranton, Pa., shops of the Delaware, Lackawanna & Western

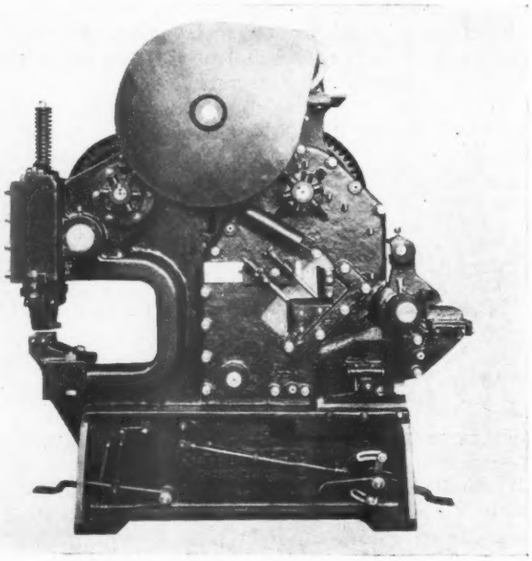
The passenger locomotive had 69-in. drivers and exerted a maximum tractive force of 43,100 lb. The new eight-wheel switcher has a tractive force of 67,300 lb. It has 27-in. by 30-in. cylinders, 58-in. driving wheels, and the boiler operates at a pressure of 210 lb., an increase of 10 lb. over that of the original locomotive.

Combination Shear and Coper

A NO. 7 combination shear, punch and coper has been completed recently by Joseph T. Ryerson & Son, Inc., Chicago, to meet the demand for a large capacity machine handling these various operations. It is built with the same features as the smaller Ryerson combination machines.

The punch is capable of handing almost all of the varieties of structural shapes found on the market today. The operation of this punch is not interfered with in any manner by the other units built into the machine. The shearing end of the machine is constructed so that a single slide handles the shearing of angles, bar cutting, plate shearing, and coping. The angle shear attachment handles both inside and outside mitering as well as straight shearing. The blades in this unit are made in sections for economical and easy replacement. Bar-cutting blades are located directly below the angle shear blades. The full range of rounds and squares is handled by one set of blades.

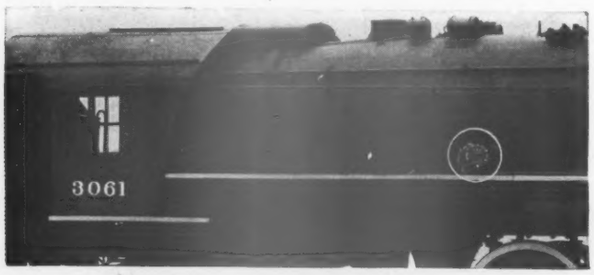
The punch attachment has a 24-in. throat and a capacity for punching $1\frac{5}{16}$-in. through 1 in. The plate shear will handle ¾-in. material of any length or width. Other capacities include flat-bar shearing 7 in. by 1 in.; round bars 2 ¼ in.; square bars 2 in.; angles 6 in. by 6 in. by ½ in.; and cutting angles in miter 4 in. by 4 in. by ½ in.; notches 4 in. by 4 in. by ½ in. angles and tees.



Ryerson combination shear, punch and coper

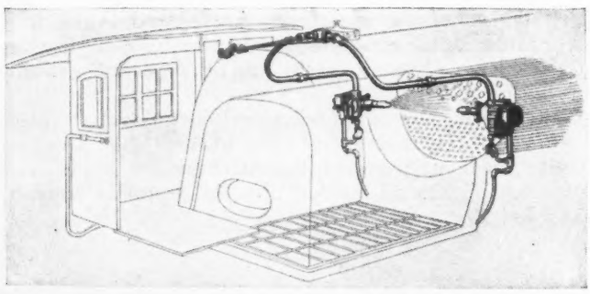
Locomotive Automatic Soot Blower

THE Rees Manufacturing Corporation, Pittsburgh, Pa., has improved and is now marketing the Superior soot blower formerly sold by the American Railway Appliance Company, New York. It is designed to maintain the flue sheet and combustion chamber of a locomotive free from honeycomb, soot and cinders under all conditions that may be encountered in modern locomotive operation. This blower is designed with the object of eliminating cleaning at terminals and to prevent the accumulation of ash and soot on the flue sheet and combustion chamber throughout the longest run. It is claimed by the manufacturers of this appliance, that its use will insure full effectiveness of the fire-heating surfaces which means better steaming on the part of the locomotive; elimination of engine failures due to dirty and plugged flues; increased boiler efficiency and increased fuel economy; the elimination of the work of dumping fires at terminals in order to clean the combustion chamber and flue sheet, and the elimination of the work of removing arch brick for cleaning and inspection of flues and flue sheet.



A typical installation of the blower on the right side of a locomotive—The blower is shown circumscribed by the white circle and is installed in the side of the combustion chamber

In order to secure the best results with the Superior soot blower, it should be used at least three minutes every 100 miles in passenger service and for the same time every three or four hours in freight service. The equipment is installed so that its operation is controlled entirely by the fireman through ordinary steam valves which admit steam to the blowers. The installation and operation of the Superior soot blower is shown in one of the illustrations. A fractional part of the steam admitted to the system operates a small turbine which oscillates the nozzles. The balance of the steam passes through the oscillating nozzles and sweeps the entire surfaces of the flue sheet. Two blowers are used on each locomotive one on each side of the firebox or combustion chamber, and are so adjusted that each blower covers 60 per cent of the flue sheet surface as



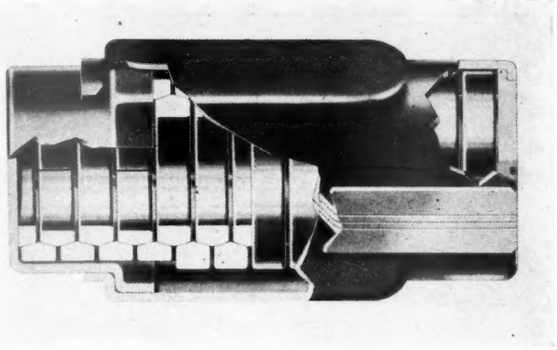
Phantom drawing showing the installation and operation of the Superior soot blower

well as the combustion chamber. Both blowers are located approximately 36 in. from the flue sheet.

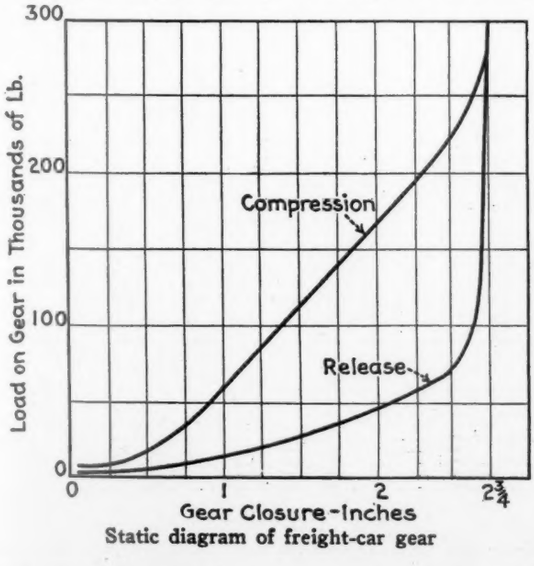
Aside from the fact that the fireman must turn the valves in order to place the soot blower in operation, it is entirely automatic. The blower is entirely enclosed, which eliminates the possibility of steam leaks which might obscure the engineman's vision. The nozzles are made of special heat-resisting metal and are also protected by a shield. The body casting which is fastened to the side sheet by four studs, houses a small turbine and driving mechanism which oscillates the nozzle. The nozzle extends through a tube in the water leg into the firebox, as shown in the phantom drawing. The tubes are cut from an arch tube. Steam from the turret is piped to the blower through a separate control valve for each blower. The control valves are located in the cab in a position convenient to the fireman. When steam is admitted to the blower the turbine oscillates the nozzle six to eight times per minute, each oscillation sweeping the entire length of the flue sheet.

The Edgewater Ring Spring Draft Gear

THE Edgewater Steel Company, Pittsburgh, Pa., has been engaged for some time in the development of the ring-spring draft gear and has recently produced an improved form of this gear for which several advantages are claimed. The most important features of the gear are its light weight, made possible by the application of the ring-spring principle; the high capacity in relation to its weight and the fact that the principal parts of the gear are packed in a lubricant. The gear weighs 250 lb., and has a capacity of 27,000 ft. lb. which is equivalent to a 33-in. free drop of a 9,000-lb. tup. This gear is one of ten makes that were tested by the A. R. A. at Purdue University during the 1929 draft gear tests, and on the endurance test showed an average energy input of 134,986,100 ft. lb.

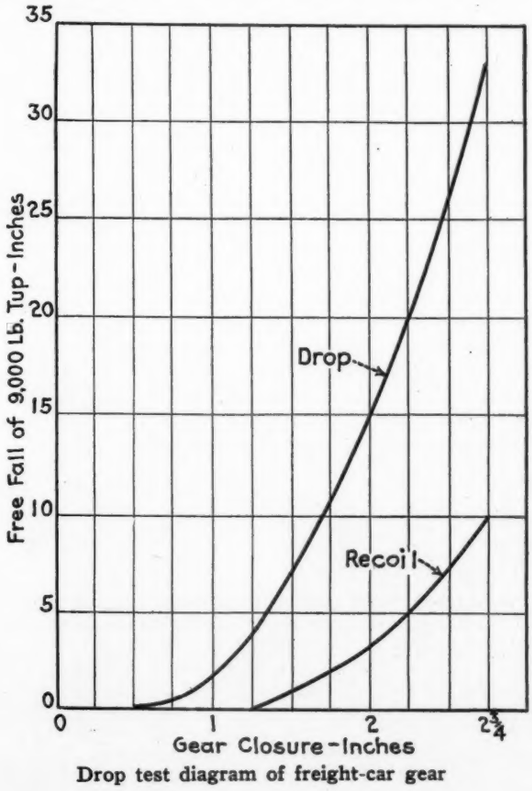


Sectional view of the Ring Spring draft gear showing its construction



Static diagram of freight-car gear

The gear consists of a suitable design of ring-spring enclosed in a pressed-steel housing which retains the ring-spring under some initial compression. An important feature of its construction is that the gear is packed during manufacture with wool waste soaked in graphite grease. Provision is made in the housing



Drop test diagram of freight-car gear

design for replenishing the lubricant when necessary. The flanges on the sides of the housing guide the gear in the pocket. The ring-spring is the result of systematic efforts, extending over a number of years, to produce a spring in which all fibres would be stressed uniformly.

The ring-spring consists of a number of outer and inner solid rings, each ring co-acting with adjacent ones along conical surfaces. There are two inner split rings used in the head end of the spring which serve to

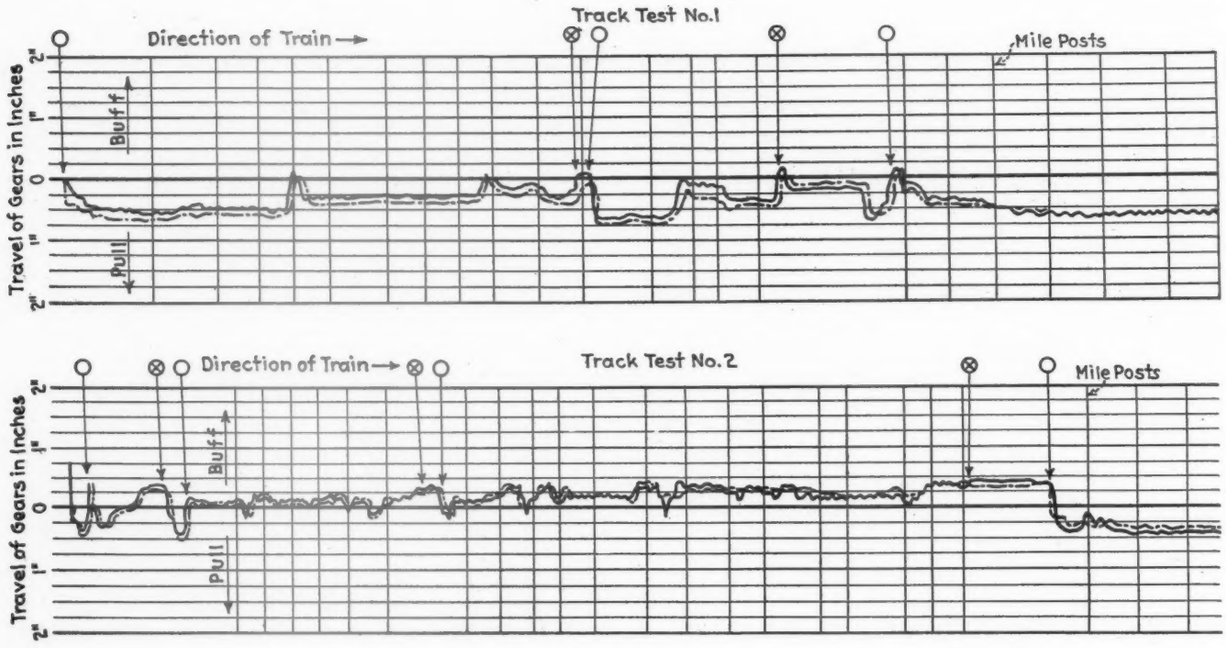


Diagram of the movements of

soften the action at the beginning of the stroke. When axial pressure is applied, the rings telescope into each other, the outer rings being subjected to practically uniform tensile stresses, and the inner ones to equally uniform compression stresses. Thus the outer rings will expand and the inner rings will compress, and each conical surface will telescope into the adjacent one a certain distance in the axial direction. The travel taking place between each pair of conical surfaces, multiplied by the number of such surfaces forms the total travel of the spring.

The amount of work that can be stored in a ring-spring at given maximum stress is much higher per cubic inch, or per pound of steel, than for any other type of spring. The amount of work done during the compression of the spring is further increased by the amount required to overcome friction between conical surfaces. Conversely the work returned during the recoil of the spring is less than the amount stored in it during compression on account of the friction between the rings. The working of the ring-spring thus involves the absorption by friction of a considerable amount of work during each cycle of operation.

The rings are manufactured from a chromium steel, rolled down to round bars. A process of shearing has been developed so as to provide blanks of proper weight cross sheared from these bars, to make the rings. These blanks, after being heated, are formed into "doughnuts" and then rolled, at the same heat, into rings of the desired diameter and cross section. In this forging and rolling process, which is very similar to that used in some of the modern plants in the manufacture of locomotive tires, rolling is done on all faces of the rings at the same time. This universal rolling produces high physical qualities in the finished product.

After the rolling operation is completed, the rings are carefully heat-treated, quenched in oil and drawn in a salt bath. Each individual ring is tested for Brinell hardness before assembling.

Because of the characteristics of the ring-spring, it forms a draft gear in which:

1—A drop-test capacity of over 33 in. free fall of a 9,000-lb. tup is obtained.

2—The work done during the compression of the

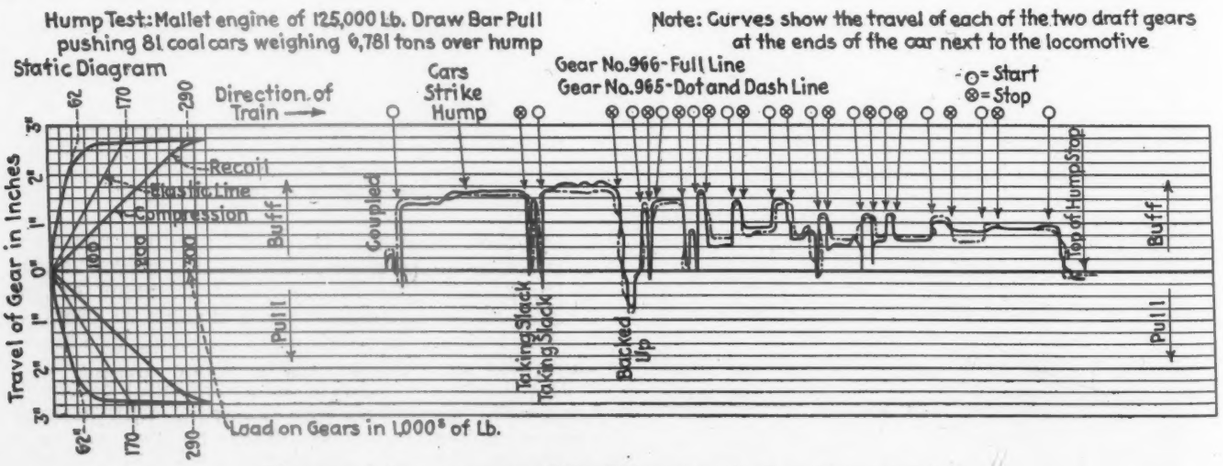
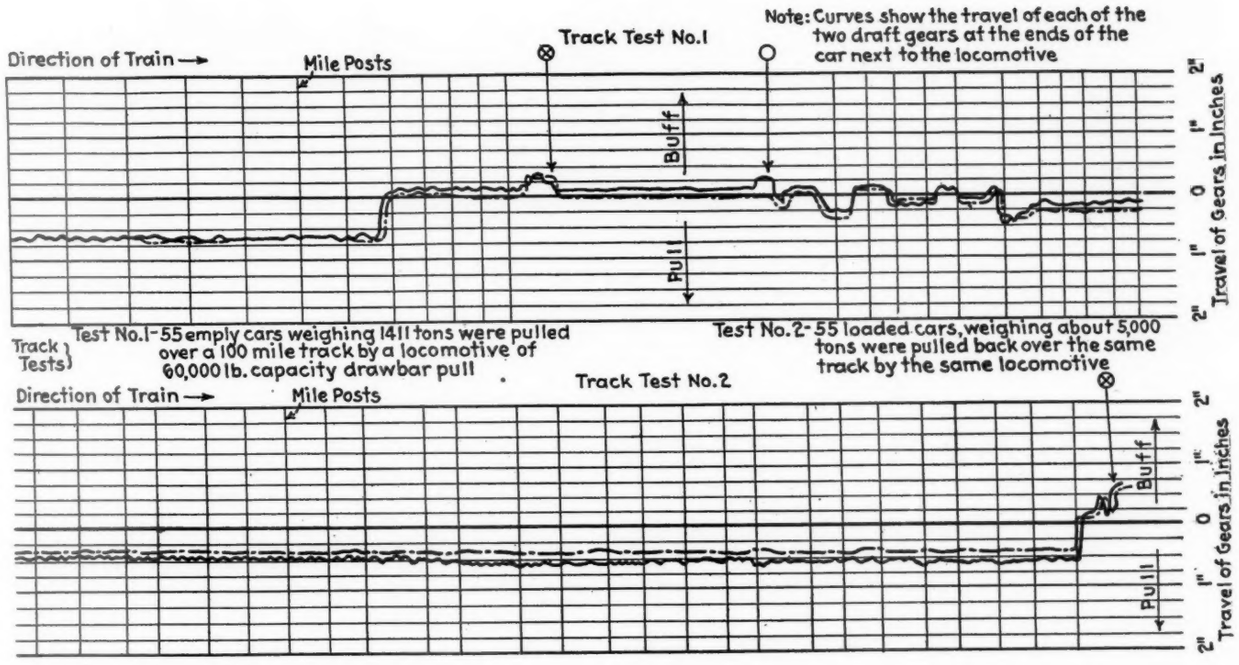


Diagram of the movements of the Edgewater gear in a hump-yard test



the Edgewater gear in road train service

gear exceeds 27,000 ft. lb., without creating an ultimate resistance of over 300,000 lb.

3—The work is taken up mainly through very powerful spring action, the fractional resistance being secondary, whereby a positive release is assured.

4—The gear has no dry friction which produces rapid wear, irregular action, and high sill stresses in the body structure.

5—The contact surfaces are lubricated and safe material stresses are used, resulting in a minimum of wear and a long life.

6—No castings are used, all parts are of forged steel, all wearing surfaces are made of heat-treated alloy steel.

7—Due to its high capacity as a spring, the ring-spring draft gear does not creep or close under the influence of sustained draft or buff and therefore has reserve capacity for any emergency.

The performance of the Edgewater ring-spring draft gear is illustrated by the accompanying drop and static diagrams.

The drop test diagram was made with the standard 9,000-lb. tup, and the gear under this test shows a capacity of 33 in. free fall, or 27,000 ft. lb. The total travel is 2¾ in. The compression and release curves are uniform indicating that the action of the gear is not jumpy or irregular.

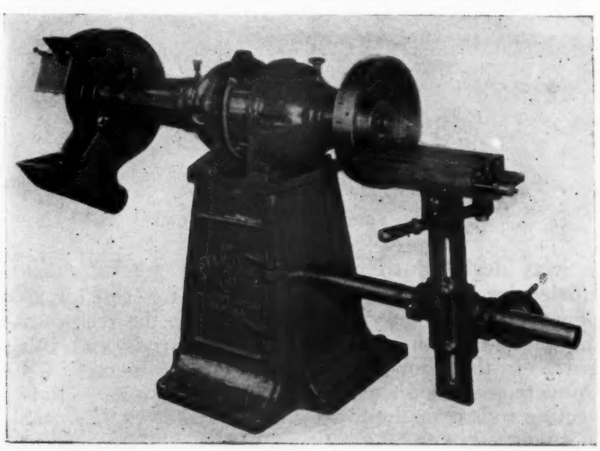
The static diagram shows a force of 300,000 lb. required to close the gear. This test was made under a standard testing machine and the smoothness of the compression and release curves illustrates the uniformity of the gear.

The accompanying set of chromograph curves were made with Edgewater gears installed in a hopper car placed between the tender and the remainder of a train. The hump-test curves were made while a Mallet type locomotive with 125,000 lb. drawbar pull was pushing 81 coal cars over a hump. As the cars were being dropped off into the classification yards, the pressure of the buff gradually decreased. By following the peaks of the curves horizontally across to the static diagram on the left the buffing pressures can be readily approximated.

Track-test curves Nos. 1 and 2 were taken from a test run made over 100 miles of track. The draft gears under test were in the first car directly between the tender and the remainder of the train. On curve No. 1, the train consisted of 55 empty cars weighing 1,411 tons and on curve No. 2, 55 loaded cars 5,000 tons.

Standard Combination Pedestal Grinder

THE Standard Electrical Tool Company, Cincinnati, Ohio, has developed the combination grinder illustrated for both general and face grinding by equip-



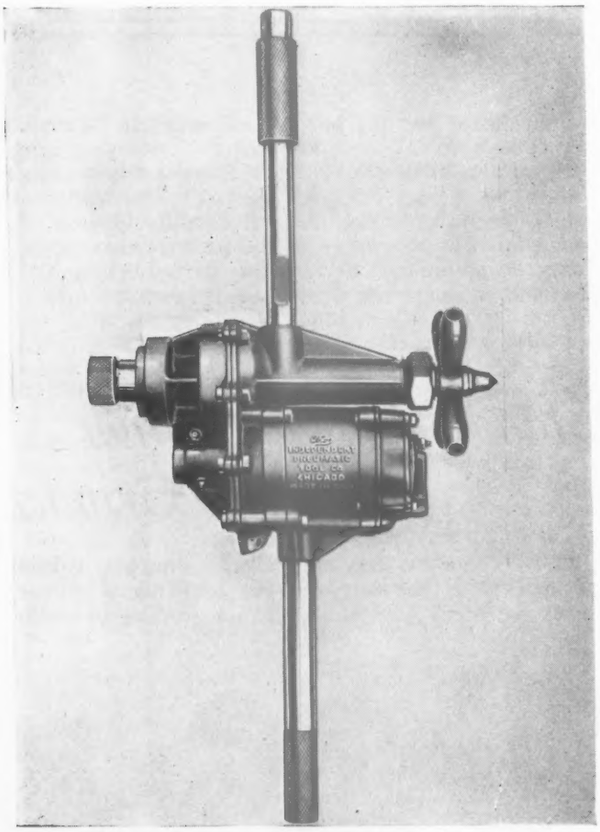
Standard grinder equipped for general and face grinding

ping one end of a Standard floor grinder with a ring-wheel chuck and an adjustable work table. The other end of the machine is designed for the application of the emery grinding wheel and is fitted with an exhaust hood and eye shield. The face grinding equipment consists of a heavy bar support on which is mounted a work table with both horizontal and vertical adjustment. The table is fitted with tee-slots for holding down the work and a horizontal movement of the table is provided on the adjustable base.

The machine is driven by a General Electric 40-deg. rise motor with S. K. F. ball bearings. There is also a ball thrust bearing to take the end thrust of the ring wheel chuck. The grinder is manufactured in 2-, 3-, 5-, and 7½-hp. sizes of which the 5-hp. size is shown in the illustration.

Rotary Pneumatic Drill

THE Independent Pneumatic Tool Company, 600 West Jackson Boulevard, Chicago, has developed a new rotary pneumatic drill, known as the Thor 275.



The Thor 275 pneumatic drill

It was designed to eliminate certain mechanical inefficiencies in piston type tools, which use considerable power and have speed limitations due to the reciprocating motion of the pistons, connecting rods and valve gear. In the Thor 275 drill, there are no inertia forces to overcome when starting or stopping pistons and connecting rods over the top and bottom centers of a crank motion.

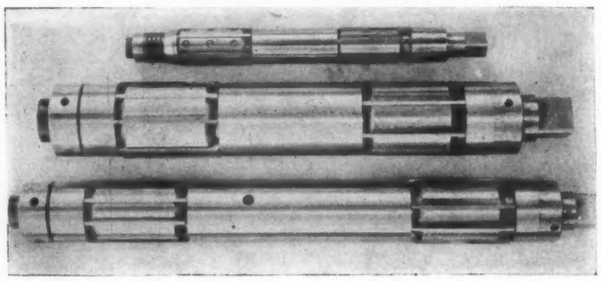
This tool has a drilling capacity of 1½ in. and a reaming capacity of 1⅛ in. It has a governed free speed of 350 r.p.m. and weighs 35 lb. It is a one-man drill, which operates smoothly and without vibration. One of its features is that it carries a 50-lb. load at the same speed at which it runs free. It carries a 100-lb. load at a reduction in speed of only 30 per cent. This is made possible because the governor is designed to open the throttle automatically. This drill will not race or vibrate excessively when being moved from one hole to the next. Its speed is governed so that it idles easily, with small air consumption.

Because of its construction the operator can get in close on the side without removing the dead handle. A special cast iron having a nickel alloy designed to withstand rotor-blade wear is used in the cylinder. Ball bearings are used throughout, including the spindle and gear.

Reamers for Motion-Work Bushings

THE accompanying illustration shows three tools recently developed for use in railroad shops by the Foster-Johnson Reamer Company, Elkhart, Ind.

These reamers have been designed to meet a special need in connection with motion work—to line ream the bronze bushings in valve rod crossheads in Walschaert and Baker valve-gear frames. Each tool is double-



Foster-Johnson Reamers for line-reaming valve-rod crosshead bushings

bladed, and the expansion or contraction of both sets of blades is controlled by one graduated adjusting nut. This feature makes it possible to ream both holes in line and the same size in one operation.

The reamer is contracted so that the front set of blades will pass through the first hole. The reamer is then expanded in this position and both holes reamed at the same time. Each tool has a large range of adjustment which permits reaming the holes to any desired size and also allows for regrinding the blades.

SIMPLIFIED PRACTICE, GRINDING WHEELS.—The Division of Simplified Practice of the Bureau of Standards, Department of Commerce, has just released a printed booklet on revised Simplified Practice Recommendation No. 45—Grinding Wheels. The most important changes in this booklet are the further elimination of wheels designated as type No. 3, tapered one side; type No. 8, countersunk dovetail, and type No. 10, raised dovetail, as well as the development of a standard nomenclature for classes of work in the grinding wheel industry. Copies of the booklet can be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 15 cents each.

News of the Month

Reward for Development Work in Gas Welding and Cutting

IN ORDER TO ENCOURAGE and aid in the development of, and to further interest in experiments tending toward lowering the cost of the welding and cutting process, the Alexander Milburn Company is offering prizes aggregating $3,000 for the best authentic articles it receives within the next three years on the development of apparatus or systems to use illuminating or city gas in place of the expensive gases now generally used for cutting and welding purposes.

Cutting with city or illuminating gas is a comparatively recent development. According to figures furnished by the United States Department of Commerce, Washington, D. C., 682,481,000 cu. ft. of compressed acetylene, exclusive of other compressed gases for similar purposes, was used during the year 1927, and it is now estimated that one billion cubic feet of acetylene is manufactured and used annually at an average cost of three dollars per 100 cu. ft. The cost of city gas averages about seven cents per 100 cu. ft. It is believed, therefore, that the use, or partial use, of illuminating gas would effect a large saving for industrial and manufacturing interests using the welding and cutting systems.

The papers submitted in this contest will be judged by a committee of competent engineers, included in the personnel of which is the head of a leading engineering university. One thousand dollars will be paid during each of the years 1930, 1931 and 1932. Particulars concerning the conditions under which the data must be furnished and the methods of determining the awards will be furnished upon application to the Alexander Milburn Company, 1614 West Baltimore street, Baltimore, Md.

Clubs and Associations

ARRANGEMENTS for the celebration of the fiftieth anniversary of its founding are now being made by the American Society of Mechanical Engineers at New York. The celebration will take place in April, 1930, and will be pre-eminently an exchange of greetings between nations through the medium of a series of papers on what engineering has done for various countries in a national sense, and also for the advancement of world culture and civilization.

Railroad Division, A.S.M.E. Elects Officers

Louis K. Sillcox, vice-president, New York Air Brake Company was elected by the General Committee for appointment by the president of the American Society of Mechanical Engineers to serve on the Executive Committee of the Railroad Division. Mr. Sillcox fills the vacancy created on the Executive Committee by the expiration of the term of R. S. McConnell, chief consulting engineer, Baldwin Locomotive Works, who has been chairman during the past year.

Prof. A. J. Wood, head of the mechanical engineering department, Pennsylvania State College; R. S. McConnell, and Marion B. Richardson, associate editor, Railway Age and *Railway Mechanical Engineer*, were elected to serve on the General Committee. Prof. Edw. C. Schmidt, head of the department of railway engineering, University of Illinois, was elected to the General Committee to fill the unexpired term of Wm. L. Bean, mechanical manager, New York, New Haven & Hartford, who resigned. The terms of the new officers begin immediately after the annual meeting of the American Society of Mechanical Engineers, December 2.

Program for Railroad Men at Annual Meeting A. S. M. E.

Following the same procedure as it did for the annual meeting of the American Society of Mechanical Engineers in 1928, the Meetings and Program Committee, Railroad Division, has arranged a consolidated program of papers which it considers to be of special interest to railway mechanical department officers. This program of papers will be presented during the annual meeting of the American Society of Mechanical Engineers, December 2 to 6, 1929, inclusive. In the arranging of this program advantage was taken of the papers and reports of other professional divisions to be presented at this meeting together with the Railroad Division's two-sessions program of four papers. The Railroad Division holds its two sessions on Thursday, December 5, during which the following papers will be presented: High-Pressure Locomotives, by A. F. Stuebing, chief engineer, Bradford Corporation; Locomotive Auxiliary Power Mediums, by George W. Armstrong, Bethlehem Steel Company; Heat Transfer in the Locomotive Superheater, by Lawford H. Fry, metallurgical engineer, Standard Steel Works Company, and Metallurgy in the Railroad Field, by Charles McKnight, metallurgist, Development & Research department, International Nickel Company. In addition to these two sessions, the Railroad Division is holding a joint session with the Oil and Gas Power Division, on Friday, December 6, at 2:00 p. m., during which a paper on the Design and Application of Rail-Motor Cars, by C. O. Guernsey, J. G. Brill Company, will be presented. A Symposium on Rail Motor Car Maintenance, led by E. K. Bloss, supervisor rail motor cars, Boston & Maine, will conclude the program for that session.

Following is the consolidated program:

MONDAY, DECEMBER 2

Present Status of the Mechanical-Spring Art, by J. K. Wood.
Elastic and Inelastic Behavior in Spring Materials, by M. F. Sayre.
Fifth Progress Report of Special Research Committee on Mechanical Springs.
Factor of Safety and Working Stress, by C. Richard Soderberg.
Quantity Control and Production Gages, by Earle Buckingham.

TUESDAY, DECEMBER 3

Progress Report of Fuels Division.
The Application of Aerial Tramways to Long and Short Hauls, by M. P. Morrison.
Progress Report of Materials Handling Division.
Economic Aspects of Gasoline-Operated Commercial Vehicles, by R. E. Plimpton.
The Economics of the Electric Truck in Delivery Service, by Charles R. Skinner, Jr.
Turning with Shallow Cuts at High Speeds, by H. J. French and T. G. Digges.
Power Required to Drill Cast Iron and Steel, by O. W. Boston and C. J. Oxford.
A Test Code for High-Speed Steel for Turning Tools, by L. H. Kenney.
Report of Sub-Committee D. on Properties of Materials of the Special Research Committee on Cutting of Metals.
Present Practice in the Use of Cutting Fluids, by S. A. McKee.
Progress Report No. 2 of Sub-Committee on Cutting Fluids.

WEDNESDAY, DECEMBER 4

The Pioneer 1800-Lb. Pressure Power Plant in America, by W. E. S. Dyer.
Management of Service Department: Budgeting and Wage Incentives Applied to a Large Organization, by William B. Ferguson and Tom H. Blair.
Performance of Oil-Ring Bearings, by George B. Karelitz.
The Service Characteristics of Diesel-Engine Lubricating Oil, by A. E. Flowers and M. A. Dietrich.
Report on the Study of Non-College Technical Education, by W. E. Wickenden.
Suggestions for Encouraging Education and Training for Industry, by H. S. Falk.

Test Code for Complete Steam-Electric Power Plants.

THURSDAY, DECEMBER 5

The Effect of Large Boilers Operated at High Capacities on the Operating Characteristics and Investment Costs of Boiler Plants, by F. S. Clark.

Performance of Modern Steam-Generating Units, by C. F. Hirshfeld and G. U. Moran.

High-Pressure Locomotives, by A. F. Stuebing.

Locomotive Auxiliary Power Mediums, by George W. Armstrong.

Progress Report of Railroad Division.

Progress Report of Oil and Gas Power Division.

Progress Report of Special Research Committee on Diesel Fuel Oil Specifications.

Heat Transfer in the Locomotive Superheater, by Lawford H. Fry.

Metallurgy in the Railroad Field, by Charles McKnight.

Working Stresses for Steel at High Temperatures, by D. S. Jacobus.

FRIDAY, DECEMBER 6

Recent Instances of Embrittlement in Steam Boilers, by Frederick G. Straub.

The Design and Application of Rail-Motor Cars, by C. O. Guernsey.

Symposium on Rail-Motor Car Maintenance, led by E. K. Bloss.

From the Master Cabinetmakers to Woodworking Machinery, by J. D. and Margaret S. Wallace.

Modern Method of Manufacturing Classical Furniture, by Harry Kimp.

Progress Report of Wood Industries Division.

The following list gives name of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs.

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605 Grand Central Terminal building, New York.

AMERICAN RAILWAY ASSOCIATION DIVISION V.—MECHANICAL.—V. R. Hawthorne, 431 South Dearborn St., Chicago. Annual convention June 18-25, Atlantic City, N. J.

DIVISION V—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago. Next meeting, Chicago.

DIVISION VI—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey St., New York. Annual convention June, 1930, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet avenue, Chicago.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth St., New York. Railroad Division, Marion B. Richardson, associate editor *Railway Mechanical Engineer*, 30 Church St., New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 7016 Euclid Ave., Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

CANADIAN RAILWAY CLUB.—C. R. Crook, 129 Charon St., Montreal, Que. Regular meetings, second Tuesday in each month, except June, July and August, at Windsor Hotel, Montreal, Que.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—G. K. Oliver, 7836 So. Morgan street, Chicago, Ill. Regular meeting second Monday in each month, except June, July and August, Great Northern Hotel, Chicago, Ill. Next meeting November 11, 8 p. m. Speaker, W. E. Dunham, superintendent car department, Chicago & North Western.

CAR FOREMEN'S CLUB OF LOS ANGELES.—J. W. Krause, 514 East Eighth St., Los Angeles, Cal. Meetings second Friday of each month in the Pacific Electric Club building, Los Angeles, Cal.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—F. G. Weigman, 720 North Twenty-third street, East St. Louis, Ill. Regular meeting first Tuesday in each month, except June, July and August, at Broadview Hotel, East St. Louis, Ill.

CENTRAL RAILWAY CLUB.—Regular meetings second Tuesday each month, except June, July and August, at Hotel Statler, Buffalo.

CHIEF INTERCHANGE CAR INSPECTORS AND CAR FOREMEN'S ASSOCIATION.—See Master Car Builders' and Supervisors' Ass'n.

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 3328 Beekman St., Cincinnati. Regular meeting second Tuesday, February, May, September and November. Next meeting November 12, 6 p.m., Chamber of Commerce. Annual dinner, election of officers, musical entertainment. Meeting sponsored by J. A. Morris, chairman, Cincinnati Operating Committee.

CLEVELAND RAILWAY CLUB.—F. L. Frericks, 14416 Adler Ave., Cleveland, Ohio. Meeting first Monday each month, except July, August and September at Hotel Hollenden, East Sixth and Superior Ave.

INTERNATIONAL RAILROAD MASTER BLACKSMITH'S ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark Ave., Detroit, Mich.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. T. Winkless, Room 707, LaSalle Street Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash street, Winona, Minn.

LOUISIANA CAR DEPARTMENT ASSOCIATION.—L. Brownlee, 3212 Delachaise street, New Orleans, La. Meetings third Thursday in each month.

MASTER BOILERMAKERS' ASSOCIATION.—A. F. Stiglmeier, secretary, 29 Parkwood St., Albany, N. Y. Annual meeting May 21-24 William Penn Hotel, Pittsburgh, Pa.

MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—A. S. Sternberg, master car builder, Belt Railway of Chicago, Chicago.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting second Tuesday in each month, excepting June, July, August and September, Copley-Plaza Hotel, Boston. Next meeting November 12, 6:30 p. m. R. L. Bender, president, Metal Coatings Company of America, will speak on metal coating.

NEW YORK RAILROAD CLUB—Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth St., New York. Mrs. M. E. Hartman, acting secretary, 26 Cortlandt street, New York.

PACIFIC RAILWAY CLUB.—W. S. Wollner, P. O. Box 3275, San Francisco, Cal. Regular meetings, second Tuesday of each month in San Francisco and Oakland, Cal., alternately. Next meeting November 14. Annual associate members night.

RAILWAY CAR DEPARTMENT OFFICERS' ASSOCIATION.—*See Master Car* Builders' and Supervisors' Association.

RAILWAY CLUB OF GREENVILLE.—Paul A. Minnis, Bessemer & Lake Erie, Greenville, Pa. Meetings third Thursday of each month, except June, July and August.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August. Ft. Pitt Hotel, Pittsburgh, Pa.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, M. P. O. Drawer 24 St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August. Next meeting November 8, 8 p.m. Paper entitled "Air Brakes Great Contribution to Transportation," will be presented by D. W. Lloyd, Westinghouse Air Brake Company, St. Louis, Mo.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meetings third Thursday in January, March, May, July, September and November. Annual meeting third Thursday in November, Ansley Hotel, Atlanta, Ga.

SOUTHWEST MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—See Master Car Builders' & Supervisors' Association.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth St., Cleveland, Ohio.

WESTERN RAILWAY CLUB.—W. J. Dichinson, 189 West Madison St., Chicago. Regular meetings, third Monday in each month, except June, July and August.

Supply Trade Notes

ERWIN J. MOHR has been appointed manager of industrial sales of the Gunite Corporation, Rockford, Ill.

WALTER KNAPP has been appointed executive engineer of the DeWalt Products Corporation, Leola, Pa.

THE AMERICAN CHAIN COMPANY, INC., has moved its Chicago offices to Room 1765, Chicago Daily News building.

THE BARCO MANUFACTURING COMPANY is constructing a three-story addition, 50 ft. by 225 ft., to its plant at Chicago.

R. B. POGUE of the engineering department of the American Brake Shoe & Foundry Company, New York, has been appointed assistant chief engineer.

THE CENTRAL IRON & STEEL COMPANY, Harrisburg, Pa., has moved its Boston office from 131 State street to the Statler building, Park Square. G. T. Armstrong remains in charge.

THE PAASCHE AIRBRUSH COMPANY, Chicago, has moved its New York sales and service branch to larger and more modern quarters at 103 Lafayette street, New York City.

THE CENTRAL ALLOY STEEL CORPORATION, Massillon, Ohio. has acquired the entire property, assets and business of the Interstate Iron & Steel Company, Chicago.

THE LOCOMOTIVE FINISHED MATERIAL COMPANY, Atchison, Kan., is building a steel foundry, 115 ft. by 400 ft., and a material building, 86 ft. by 300 ft. in that city.

N. B. McREE, service engineer of the United States Graphite Company has been promoted to manager of railroad sales to succeed W. R. Pflasterer, resigned.

THE LANDIS MACHINE COMPANY, Waynesboro, Pa., has opened an office in the Marshall building, Cleveland, Ohio, in charge of J. T. Benchoff, district manager.

FRANK HENDERSON, manager of the Cleveland office of the Combustion Engineering Corporation, New York, died on September 25.

ALEXANDER L. SCHUHL, manager of the Philadelphia office of the Independent Pneumatic Tool Company, died on October 20.

LEWIS C. HAIGH of the Magor Car Corporation sales department has been elected secretary, with headquarters at New York.

JAMES F. CROFT has resigned as metallurgist of the Mackintosh Hemphill Company, Pittsburgh, Pa., to take a position of like capacity with the Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa., in charge of its roll department.

ALBERT J. SAMS, 28 East Jackson boulevard, Chicago, has been appointed exclusive railway sales representative for the Little Giant Company, manufacturers of the Little Giant power hammer.

E. T. WADE has been appointed representative of the Davis Brake Beam Company, Johnstown, Pa., for the South Atlantic states. Mr. Wade's office is at 1222 Mutual building, Richmond, Va.

THE AMERICAN LOCOMOTIVE COMPANY has acquired control of the McIntosh & Seymour Corporation, Auburn, N. Y. The McIntosh & Seymour Corporation has manufactured Diesel engines for marine, stationary and transportation use since 1914. It is understood that the corporation will continue to operate under the present management, but as a subsidiary of the American Locomotive Company. The two companies already have collaborated on the design and production of an oil-electric passenger locomotive.

THE UNION DRAFT GEAR COMPANY, Chicago, by corporate action has changed its name to the Cardwell Westinghouse Company. The new company will hereafter conduct the draft gear business formerly owned by the Westinghouse Air Brake Company, as well as that of the Union Draft Gear Company. As heretofore, the Westinghouse draft gear will be manufactured by the Westinghouse Air Brake Company at its Wilmerding, Pa., plant. The following officers of the Cardwell Westinghouse Company have been elected: Chairman of the Board, A. L. Humphrey, president of the Westinghouse Air Brake Company; president, J. R. Cardwell, president of the Union Draft Gear Company; vice-president, L. T. Canfield, vice-president of the Union Draft Gear Company; secretary-treasurer, C. H. Tobias, secretary and treasurer of the Union Draft Gear Company. The main office of the company will be at 332 S. Michigan avenue, Chicago, with branch offices in New York, Pittsburgh, St. Louis and Montreal.

THE ALEXANDER MILBURN COMPANY, Baltimore, Md., has opened an office at 1855 Industrial street, Los Angeles, Cal., under the name of the Alexander Milburn Sales Company. George R. Roberts is in charge of the office.

CHARLES REES, consulting engineer of the Vanadium Corporation of America, New York, has been appointed vice-president in charge of mining operations. Mr. Rees is a geologist and mining engineer.

HOWARD MULL, who has been elected vice-president of the Warren Tool & Forge Company, Warren, Ohio, was in the employ of the engineering department of the Cleveland, Cincinnati, Chicago & St. Louis from 1909 to November, 1912, at which time he was transferred to the operating department at Cleveland. On May 1, 1913, he left the employ of the Big Four to become associated with the Verona Tool Works and in December, 1913, was made traveling representative, which position he held until June, 1918, when he was placed in complete charge of sales. He held this position until December 31, 1920, when he resigned to enter the employ of the Warren Tool & Forge Company as manager of the railroad department which position he held until his recent appointment.

Howard Mull

THE AUTOMATIC TRANSPORTATION COMPANY, Buffalo, N. Y., has established a factory at 531 Pershing road, Chicago. L. R. Lindsley has been appointed Chicago sales manager and W. F. Weber has been appointed assistant Chicago sales manager.

THOMAS CARDWELL has been appointed representative of the Falls Hollow Staybolt Company, Cuyahoga Falls, Ohio, for Missouri, Kansas, Texas and surrounding states, with headquarters at 770 Paul Brown Building, St. Louis, Mo.

H. E. PASSMORE, Pittsburgh, Pa., has been appointed railroad representative of Tate-Jones & Co., Inc., Leetsdale, Pa. Mr. Passmore has been appointed railroad representative also of the Duraloy Company, Pittsburgh, Pa.

CARL MOSIER, who has been elected vice-president and general manager of the Union Asbestos & Rubber Company with headquarters at Chicago, was born in Chicago and in June, 1904, after leaving high school, entered the employ of the Union Pacific-Southern Pacific System at Chicago, as a junior clerk and stenographer. Later he was employed by the Illinois Central in the president's office and subsequently for a number of years served as secretary to the president of the Chicago & Alton. In November, 1914, he was appointed chief clerk to the purchasing agent of the Chicago & Alton, and in October, 1916, he left railroad service to enter the employ of the Union Asbestos & Rubber Company. In May, 1918, he was promoted to secretary and treasurer, which position he held until his recent promotion. Lewis J. Silverman succeeds Mr. Mosier as secretary and treasurer, and will also act as general counsel.

Carl Mosier

C. E. LEACH, assistant manager of sales has been elected a director and secretary and treasurer of the New York Air Brake Company, New York, to succeed R. B. Sheridan, resigned.

THE GEAR BUSINESS of the Wappat Gear Works Division of the Simonds Saw & Steel Company having been gradually supplemented by a line of portable wood-working tools, the company name has been changed to Wappat, Inc.

THE HILL-CURTIS COMPANY, Kalamazoo, Mich., has changed its name to the Hammond Machinery Builders, Inc., there being no change either in the organization of the company or its policies.

THE DESCH SUPPLY AND EQUIPMENT COMPANY, 16 South Frederick street, Baltimore, Md., has been appointed representative of the General Refractories Company to handle the sale of high temperature cement in Maryland and Washington, D. C.

JAMES P. ALLEN has resigned as president and general manager of the Union Steel Casting Company, Pittsburgh, Pa., also as a director of that company. Mr. Allen will continue on the board of directors of the Blaw Knox Company of which the Union Steel Casting company is a subsidiary.

ERNEST F. HARDER, assistant to the vice-president of the Westinghouse Electric & Manufacturing Company, and for over 40 years identified with the electrical manufacturing industry, died at his home in East Orange, N. J., on October 13.

BYRON M. CHENEY has resigned as district sales manager of the Verona Tool Works, with headquarters at Chicago, to devote his time to personal interests. Porter L. Laughlin, formerly

district sales manager for this company at Chicago, has been re-appointed to this position to succeed Mr. Cheney.

THE LINDE AIR PRODUCTS COMPANY, New York, has opened a new oxygen plant at 1628 Cascade street, Erie, Pa. J. J. McKeen is superintendent of the plant and R. S. Hamilton, with headquarters at East Buffalo, N. Y., is district superintendent.

THE NEW YORK AIR BRAKE COMPANY announces the resignation of James H. Watters, vice-president, to accept the presidency of another company. L. K. Sillcox has been elected vice-president, and K. E. Keiling has been appointed general sales agent.

ECCLES & DAVIES MACHINERY COMPANY, INC., Los Angeles, Cal., have been appointed West Coast representatives of the Hyatt Roller Bearing Company. H. O. K. Meister has been appointed assistant general manager of the Hyatt Company, with headquarters at Newark, N. J.

JOSEPH JACOBSON, with headquarters at Detroit, Mich., has joined the sales force of the Goodell-Pratt Company, Greenfield, Mass. John Metz, Richmond Hill, Long Island, has taken over the territory in New York formerly assigned to E. C. Mesloh, and the F. J. Keller Company, Dallas, Tex., has been appointed to handle sales in that territory.

THE AIR-WAY ELECTRIC APPLIANCE CORPORATION, Toledo, Ohio, has bought the entire business of Erie Heating Systems, Inc., Erie, Pa., and the Erie industry has been moved to Toledo. The production and distribution of Air-Way unit heaters (as the former Erie heater is now called), will now be carried on by the Toledo company.

R. E. KELLY, formerly manager of the Boston office of the Independent Pneumatic Tool Company, Chicago, has been appointed sales engineer for the eastern district, with headquarters at New York, and John Ashton, salesman in the New York district, has been appointed manager of the Boston office.

WILLOUGHBY S. LEECH has joined the staff of the G. M. Basford Company. Mr. Leech has been engaged in advertising and sales counsel work for about eight years. He will have his headquarters at Pittsburgh, Pa., and be in charge of a branch office which the G. M. Basford Company has opened in the Koppers building, Pittsburgh.

THE CLEVELAND TOOL & SUPPLY COMPANY, Cleveland, Ohio, now represents H. D. Conkey & Co., Mendota, Ill., for the sale of their overhead traveling crane equipment in the Cleveland district. H. P Conkey & Co. is building an addition to its plant at Mendota, which will about double its present capacity.

JOSEPH T. RYERSON & SON, INC., Chicago, has sold its complete line of table and floor type horizontal boring, drilling and milling machines to the Ohio Machine Tool Company, Kenton, Ohio. The Ryerson Company, however, retains the sole rights as exclusive distributors of the line. The Ohio Machine Tool Company has been building these machines for some time for the Ryerson Company and now will expand and improve them.

D. H. CORLETTE, who has been in charge of investigation and research for the Wood Conversion Company, Cloquet, Minn., has been promoted to manager of railroad and industrial sales, a newly created position, and will be in charge of all sales to railroads, aircraft and motor coach manufacturers, government departments and industrial concerns. Mr. Corlette's headquarters are at Chicago where he will direct the sales of the present New York, Detroit and Washington offices and of additional branches to be established later.

OTTO ABRAHAMSEN, for 20 years treasurer and in charge of sales of Beaudry power hammers as manufactured by the Beaudry Company, Inc., Boston, before it went into liquidation, has become affiliated with the Moloch Foundry & Machine Company, Kaukauna, Wis., in charge of sales of the Moloch hammer, with headquarters at Kaukauna. The Moloch Foundry & Machine Company has under consideration adding a line of pneumatic forge hammers for heavy work and a line of board drop hammers to its products.

M. E. DANFORD, works manager of the Middletown (Ohio) division of the American Rolling Mill Company, has been appointed assistant vice-president. Mr. Danford started work with the American Rolling Mill Company in February, 1910, as superintendent of the open hearth department of the Central Works plant. In July, 1911, he was appointed assistant to Charles R. Hook, then general superintendent of the company. In July, 1916, Mr. Danford was appointed general superintendent of the Middletown division and in 1921 was appointed works manager of that division.

THE INTERNATIONAL DERRICK & EQUIPMENT COMPANY, Columbus, Ohio, has bought a plot of ground in Houston, Texas, as a site for a large manufacturing plant. Construction of the first unit will be started shortly. In September this company bought the Boykin Machinery & Supply Company, Beaumont, Tex. This latter has been reorganized as a subsidiary of the International Derrick & Equipment Company and will be known as the International Derrick & Equipment Company of Texas. Both the Houston and Beaumont plants will be under the subsidiary company's management.

THE ENTIRE FOREIGN BUSINESS of the Johns-Manville Corporation, New York, has been taken over by the Johns-Manville International Corporation for the purpose of more efficiently developing that business throughout the world. The board of directors of the new corporation are as follows: Lewis H. Brown, chairman; W. R. Seigle, E. M. Voorhees, P. A. Andrews, J. S. Adams, E. S. Crosby and C. L. Sager. The officers are: W. R. Seigle, president; P. A. Andrews, vice-president in charge of sales; J. S. Adams, vice-president in charge of sales promotion; J. S. Crawford, treasurer; C. L. Sager, secretary, and J. L. Pichetto, assistant treasurer.

D. S. MAIR of the D. S. Mair Machinery Company, Houston, Texas, and Charles J. Harter, railroad representative of Joseph T. Ryerson & Son, Inc., have formed the D. S. Mair Machinery Corporation. Mr. Harter will have charge of the Dallas office at 4521 Edmondson avenue, Dallas, Texas. The new corporation will represent Joseph T. Ryerson & Son, Inc., in its machinery sales only, for both commercial and railroad accounts, in the states of Texas, Louisiana and in the southern part of Arkansas. It will likewise continue to handle the accounts of the Whiting Corporation, Harvey, Ill., and the Landis Machine Company, Waynesboro, Pa.

FRANK H. CLARK, vice-president and a director of the Pilliod Company, New York, has been placed in charge of western sales, with headquarters at Chicago, following the death of J. H. Cooper, western manager. Mr. Clark has been associated with the railway supply business for 35 years, having entered business in 1894 with the Standard Coupler Company. In 1912 he organized the Chambers Valve Company, which was acquired by the Bradford Corporation in 1923, and in 1916, the Edwin Stoker Company. Mr. Clark is also a director of the Bradford Corporation and has been associated with the Pilliod Company during the past ten years.

THE INDUSTRIAL FINISHERS DIVISION of E. I. du Pont de Nemours & Co., has organized a transportation sales department to include railway, aviation and marine sales activities. Alfred E. Pratt, manager of railway sales, has been appointed manager of transportation sales, with headquarters at Parlin, N. J. Frank H. Crawford, western manager, railway sales, has been promoted to the position of eastern manager of transportation sales, with headquarters at Parlin. L. M. Ritchie, district manager of railway sales at Cleveland, Ohio, has become western manager, transportation sales, with headquarters at Chicago, and Frank P. Quinn, manager of marine sales, has been appointed district manager of transportation sales, with headquarters at Parlin.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers. State the name and number of the bulletin or catalog desired, when mentioned in the description.

REAMERS.—In its catalogue No. 30 the Foster-Johnson Reamer Company, Elkhart, Ind., illustrates expanding type air-brake reamers for hand operation only. The blades of these reamers expand parallel, expansion or contraction being controlled entirely by one graduated adjusting nut. Cuts as small as one-half thousandth can be removed with the F-J reamer.

DEVILBISS SPRAY-PAINTING SYSTEMS.—DeVilbiss spray painting and finishing equipment for use in railroad shop operation and maintenance is described in catalogue RA issued by the DeVilbiss Company, Toledo, Ohio. Eight of the outstanding features in the construction of the DeVilbiss self alining spray head and its operation are described in detail in the first six pages of the catalogue. The remaining pages give specifications and prices for various types of painting and finishing outfits, ventilating equipment, air compressing equipment and spray-painting equipment accessories.

LANDIS HANDBOOK.—The Landis Machine Company, Inc., Waynesboro, Pa., has prepared this hand book for users and operators of Landis threading equipment and Victor taps to assist them in obtaining the most efficient and most economical results. The instructions contained therein include the grinding of Landis chasers, the operation of Landis threading heads and machines, the grinding of Victor chasers and the operation of Victor taps. The book also treats briefly the adaptability of Landis heads to cut special threads and contains valuable data in reference to special threads as are encountered in the manufacture of railway cars, locomotives, machine tools, etc.

THREADED PART DATA BOOK.—The data in this book has been prepared by the Eastern Machine Screw Corporation, New Haven, Conn., to assist designers, engineers and draftsmen, as well as manufacturing departments, in preparing their threaded parts specifications so that such parts may be produced in the most economical manner. It contains definitions of the more important terms used in the 1929 report of the Screw Thread Commission, an outline of the conditions under which screw machine products are bought and sold, and questions and answers concerning the selection of a self-opening die head. The conditions under which screw machine products are bought and sold are those established as standard practice by the Screw Machine Products Association.

CENTRALIZED LUBRICATION.—Many applications of the Farval positive centralized system of lubrication for all types of machinery are described in a new booklet recently put out by Lubrication Devices, Inc., 80 S. Washington street, Battle Creek, Mich. Numerous illustrations used throughout the booklet are impressive, showing as they do the application of this lubrication system to machinery in many branches of service. Two applications of particular interest to railroad men are the lubrication of (1) a heavy-duty car wheel lathe on the Michigan Central at Detroit, Mich., and (2) what is said to be the largest milling machine in the world for machining locomotive bed frames and cylinders which is installed at the Granite City, Ill., plant of the Commonwealth Steel Company. The last two pages in the bulletin illustrate in a clear and concise manner the way in which the positive and centralized features of the Farval lubrication system are obtained.

Personal Mention

General

H. H. HAUPT, superintendent of motive power of the Northwestern division of the Pennsylvania, with headquarters at Chicago, has been transferred to the Northern division, with headquarters at Buffalo, N. Y., succeeding M. R. Reed.

M. R. REED, superintendent of motive power of the Northern Division of the Pennsylvania at Buffalo, N. Y., has been transferred to the Eastern Pennsylvania division, with headquarters at Harrisburg, Pa. Mr. Reed succeeds C. B. Keiser.

W. G. BLACK, who has been appointed mechanical assistant to the president of the Chesapeake & Ohio and the Hocking Valley, with headquarters at Cleveland, Ohio, was born on April 19, 1877, at Lima, Ohio. After a public school education, which was followed by a course in the Metropolitan Business College at Chicago, Mr. Black entered railway service in 1893 as a machinist apprentice at the Stony Island (Chicago) shops of the New York, Chicago & St. Louis. In 1897 he entered Armour Institute at Chicago, taking a post-graduate course in mechanical subjects, then becoming a machinist at the Burnside (Chicago) shops of the Illinois Central. From 1900 until 1903 he was employed at the South Chicago plant of the Illinois Steel Company and in February of the latter year he re-entered the service of the Nickel Plate as a machinist. Later in 1903 Mr. Black was promoted to machine shop foreman; in 1904 advanced to enginehouse foreman at Fort Wayne, Ind., and on January 1, 1909, promoted to the position of master mechanic at the Stony Island shops, where he remained until February, 1923, when he became superintendent of motive power of the Nickel Plate and the Lake Erie & Western districts of the Nickel Plate, with headquarters at Cleveland. On January 1, 1927, Mr. Black's jurisdiction was extended to cover the entire system and in the following month he was appointed mechanical assistant to the president of the Erie, with headquarters at Cleveland. He resigned this position to become mechanical assistant to the president of the C. & O.

W. G. Black

J. A. SHEEDY, master mechanic of the Pennsylvania at Wilmington, Del., has been promoted to superintendent of motive power of the Northwestern division at Chicago, succeeding H. H. Haupt.

H. P. ALLSTRAND, assistant superintendent of motive power and machinery of the Chicago & North Western, has been promoted to principal assistant general superintendent of motive power and machinery, with headquarters as before at Chicago. The position of superintendent of motive power and machinery held by H. L. Harvey, deceased, has been abolished.

C. S. PATTON, superintendent of motive power of the Northern district of the Seaboard Air Line at Savannah, Ga., has been appointed to the newly created position of general superintendent of motive power, with headquarters in the same city. He will have jurisdiction over all officers and employees heretofore reporting to the chief of motive power and equipment, which position has now been abolished.

C. S. Patton

Mr. Patton was born on April 4, 1871, at Telford, Tenn. He was educated in the schools of that city and entered railroad service with the Norfolk & Western in September, 1892, as a brakeman. He was later appointed fireman and from February, 1897, to November 20, 1901, he served as engineer for the same road. Mr. Patton entered the service of the Seaboard Air Line as engineer on the latter date and in February of the following year he was promoted to road foreman of engines. He became trainmaster in August, 1905, and six years later he was appointed master mechanic, serving in that capacity until September, 1916, when he was promoted to the position of superintendent, which position he held until July 1918. Mr. Patton was appointed superintendent of motive power on the latter date, continuing in that capacity until his appointment as general superintendent of motive power.

FLOYD R. MAYS, general superintendent of the Yazoo & Mississippi Valley at Memphis, Tenn., has been appointed general superintendent of motive power of the Illinois Central, with headquarters at Chicago, succeeding R. W. Bell, resigned. Mr. Mays has been connected with the Y. & M. V. and the Illinois Central for 28 years. He was born at Crockett, Va., on August 28, 1879, and entered railway service at the age of 15 years as a machinist apprentice on the Norfolk & Western. Later he was advanced to machinist and in 1901 became a machinist on the Y. & M. V. From October, 1901, to 1917 Mr. Mays served successively as locomotive fireman, locomotive engineman, instructor on transportation rules, traveling engineer, assistant trainmaster and trainmaster. In August, 1917, he was promoted to superintendent of the New Orleans division, with headquarters at Vicksburg, Miss., where he remained until March, 1923, when he was transferred to the Illinois division of the Illinois Central, with headquarters at Champaign, Ill. Mr. Mays was promoted to general superintendent of the Y. & M. V. in January, 1926, and his appointment as general superintendent of motive power of the Illinois Central became effective on October 1. Mr. Bell had been general superintendent of motive power of the Illinois Central for 16 years. He was apointed master mechanic on the Illinois Central at East St. Louis, Ill., in 1902, where he remained until the following year, when he was transferred to Waterloo, Iowa. In 1908 he was promoted to assistant superintendent of machinery, with headquarters at Chicago, and in the next year he was again promoted to superintendent of machinery, with headquarters at the same point.

Floyd R. Mays

L. S. KINNAIRD, superintendent of motive power of the Chicago & Eastern, Illinois, has been placed in charge of the locomotive department at Danville, Ill., the maintenance of equipment department having been divided into locomotive and car departments. Mr. Kinnaird will report to the vice-president and general manager.

CLARENCE B. KEISER, who has been appointed assistant to the general superintendent of motive power of the New York zone of the Pennsylvania, with headquarters at New York, was born on September 19, 1874, at West Milton, Pa. He was graduated from Pennsylvania State College in 1898 with a degree in electrical engineering. He entered railway service with the Pennsylvania in July, 1900, as a draftsman in the office of the mechanical engineer at Altoona, Pa. From November, 1902 until May, 1905, Mr. Keiser was inspector in the office of the superintendent of motive power of the Philadelphia, Wilmington & Baltimore (now a part of the Pennsylvania) at Wilmington, Del., and from the latter date until June, 1906, served as assistant master mechanic at the Wilmington shop of the Philadelphia, Baltimore & Washington (now also a part of the Pennsylvania). He then became assistant electrical engineer on the West Jersey & Seashore, being in charge of electric train operation and maintenance, with headquarters at Camden, N. J., and remained in that position until March 31, 1909. From April 1, 1909, until December 31, 1911, Mr. Keiser was master mechanic at the New York terminal electric zone, and then served in the same capacity on the New York division, electric zone, with headquarters at New York, until October 31, 1918. He was then appointed superintendent of motive power of the Southern division, with headquarters at Wilmington, Del., and on April 1, 1920, was transferred in the same capacity to the Eastern Pennsylvania division, with headquarters at Harrisburg, Pa., which position he was holding at the time of his recent appointment.

Clarence B. Keiser

Shop and Enginehouse

J. P. RUMSBY, district foreman of the Union Pacific at Marysville, Kan., has been appointed general foreman, locomotive department, with headquarters at Kansas City, Kan.

F. A. CROMWELL, a machinist at the Altoona, Pa., shops of the Pennsylvania, has been promoted to the position of gang foreman, with headquarters at Orangeville, Md.

A. C. MYERS, a machinist helper at the Enola, Pa., enginehouse of the Pennsylvania, has been promoted to the position of gang foreman, with headquarters at Orangeville, Md.

Owen F. Rice, a machinist at the Hollidaysburg, Pa., enginehouse of the Pennsylvania, has been promoted to the position of gang foreman, with headquarters at Harrisburg, Pa.

H. A. SAMPSELL, general foreman of the Boston & Maine at Billerica, Mass., has been promoted to the position of assistant superintendent of shops, succeeding F. W. Buckpitt.

FRED T. KINZEL, traveling piecework inspector of the Boston & Maine, has been appointed general foreman, with headquarters at Billerica, Mass, succeeding H. A. Sampsell.

JOHN E. LOY, machine foreman at the Forty-Seventh street shops of the Chicago, Rock Island & Pacific at Chicago, has retired after a continuous service of forty-one years.

W. C. STEPHENSON, general foreman of the Atlantic Coast Line, with headquarters at Tampa, Fla., has been appointed shop superintendent, with headquarters in the same city.

L. T. BACOT, enginehouse foreman of the Southern Pacific at Alamogordo, N. M., has been promoted to the position of general foreman, with headquarters at Tucumcari, N. M.

L. M. DEITZ, machinist, has been promoted to the position of enginehouse foreman of the Chicago, Burlington & Quincy, with headquarters at St. Joseph, Mo.

PAUL THOMAS, motive power inspector in the office of the superintendent of motive power of the Southern division of the Pennsylvania, has been promoted to the position of gang foreman at the Wilmington, Del., enginehouse.

A. J. THOMAS, assistant general supervisor of shop methods of the Canadian National with headquarters at Montreal, Quebec, Canada, has left that road to become connected with other interests in Montreal.

J. P. O'NEAL, a machinist in the employ of the Chicago, Burlington & Quincy at Beardstown, Ill., has been promoted to the position of enginehouse foreman, with headquarters at Kansas City, Mo.

C. V. CONLISK, enginehouse foreman of the Gulf Coast & Santa Fe at Temple, Tex., has been promoted to the position of general foreman, with headquarters at Sweetwater, Tex., succeeding T. Moore, deceased.

C. I. CLUGH, motive power inspector at the Altoona machine shop of the Pennsylvania, has been promoted to the position of motive power inspector in the office of the superintendent of motive power at Harrisburg, Pa.

W. M. GLEEN, enginehouse foreman of the Chicago, Rock Island & Pacific at Chicago, has been promoted to the position of general foreman, with headquarters at Chickasha, Okla., succeeding M. J. O'Leary, deceased.

J. H. MCPARTLAND, erecting shop foreman of the Chicago, Rock Island & Pacific at Horton, Kan., has been promoted to the position of enginehouse foreman, with headquarters at Chickasha, Okla.

E. W. O'BRIEN, erecting shop foreman of the Atlantic Coast Line at Tampa, Fla., has been appointed general foreman, with headquarters at the same city, succeeding W. C. Stephenson. Mr. O'Brien was born on March 10, 1883, at Richmond, Va. He entered railroad service on June 1, 1898, as a machinist apprentice on the Atlantic Coast Line and after completing his apprenticeship in June, 1902, served consecutively as a machinist for the following companies: Norfolk & Western, Bluefield, W. Va.; Chesapeake & Ohio, Hinton, W. Va.; Newport News Dry Dock Company, Newport News, Va., and American Locomotive Company, Richmond, Va. In January, 1905, he was promoted to the position of contractor and erecting foreman of the steam shovel department of the American Locomotive Works; in August, 1907, re-entered the employ of the Atlantic Coast Line as a machinist at Rocky Mount, N. C.; in July, 1911, promoted to gang foreman, erecting shop; in April, 1915, appointed erecting shop foreman, and on January 15, 1927, transferred to Tampa.

Master Mechanics and Road Foremen

JAMES BRUCE, master mechanic of the Northern Pacific at Tacoma, Wash., has been granted a leave of absence because of ill health.

H. E. LOGAN, general foreman of the Chicago, Burlington & Quincy at Kansas City, Mo., has been appointed road foreman of engines.

J. F. KIMBELL, general foreman of the Southern Pacific at El Paso, Tex., has been appointed master mechanic, with headquarters at Tucumcari, N. M.

S. R. MAULDIN, master mechanic of the Illinois Central at Jackson, Tenn., has been appointed master mechanic, with headquarters at Vicksburg, Miss., succeeding G. C. Christy.

L. A. KUHNS, master mechanic of the Illinois Central at East St. Louis, Ill., has been appointed master mechanic, with headquarters at Jackson, Tenn., succeeding S. R. Mauldin.

H. N. SEELY, master mechanic of the Illinois Central at Centralia, Ill., has had his jurisdiction extended to cover the St. Louis division, including the East St. Louis terminal.

G. C. CHRISTY, master mechanic of the Illinois Central at Vicksburg, Miss., has been appointed superintendent of the car department, with headquarters at Chicago.

H. E. FELTER has been appointed assistant master mechanic of the Hannibal division of the Chicago, Burlington & Quincy, with headquarters at Brookfield, Mo., succeeding F. R. Butts.

F. A. WEATHERFORD, general foreman of the locomotive department of the Seaboard Air Line, has been appointed master mechanic of the South Carolina division, with headquarters at Savannah, Ga., succeeding E. H. Roy.

C. G. BROWN, assistant master mechanic on the Philadelphia division of the Pennsylvania, with headquarters at Harrisburg, Pa., has been promoted to master mechanic at Indianapolis, Ind.

LUKE J. GALLAGHER, assistant master mechanic of the Fargo division of the Northern Pacific, with headquarters at Staples, Minn., has been promoted to master mechcanic of that division, with headquarters at Dilworth, Minn., succeeding Charles Emerson.

CHARLES EMERSON has been transferred to the Tacoma division of the Northern Pacific with headquarters at Tacoma, Wash., as acting master mechanic. Mr. Emerson succeeds James Bruce.

F. R. BUTTS, assistant division master mechanic of the Hannibal division of the Chicago, Burlington & Quincy at Brookfield, Mo., has been promoted to master mechanic of the Creston and West Ottumwa divisions, with headquarters at Creston, Iowa.

N. E. ENTRIKEN, assistant master mechanic of the Fargo division of the Northern Pacific at Staples, Minn., has been appointed master mechanic of the St. Paul division, succeeding J. B. Neish, and the position of master mechanic at Fargo has been abolished.

J. B. NEISH, master mechanic of the St. Paul division of the Northern Pacific, with headquarters at St. Paul, Minn., has been promoted to assistant to the mechanical superintendent of the Western district, with headquarters at Seattle, Wash. Mr. Neish takes over the duties of James Simpson, general master mechanic of the Western district at Seattle, who has retired. The office of general master mechanic of the Western district has been abolished.

JAMES SIMPSON has retired as general master mechanic of the Western district of the Northern Pacific at Seattle, Wash. Mr. Simpson was born at Shrewsbury, England, and entered the railway service in 1878 as an apprentice machinist on the Michigan Central at Jackson, Mich. He entered the service of the Northern Pacific in 1883 as a machinist at Brainerd, Minn., and during the following 24 years was advanced successively through the positions of machinist at Mandan, N. D.; night foreman at Jamestown, N. D.; machine shop foreman at Mandan and at Fargo, N. D., and general foreman at Mandan and at Staples. On June 1, 1907, Mr. Simpson was promoted to the position of master mechanic at Dilworth, Minn., and was transferred to Livingston, Mont., on March 1, 1912, and to Spokane, Wash., on October 25, 1918. On August 26, 1920, he was appointed general master mechanic of the Western district.

Obituary

ALBERT J. MITCHENER, division general car foreman of the Michigan Central, died at St. Thomas, Ont., on September 15.

R. W. BELL, who resigned as general superintendent of motive power of the Illinois Central on October 1, died of acute indigestion at Mackinac Island, Mich., on October 14.

HENRY EISELE, former assistant superintendent of the locomotive department of the Wabash, who retired from active service in 1926, died at his home in Decatur, Ill., on October 8 after an illness of three years. Mr. Eisele had been connected with the mechanical department of the Wabash for nearly 28 years, beginning in August 1898, when he entered railway service as a machinist apprentice at the Springfield (Ill.) shops. Following his apprenticeship he became a machinist and in August, 1905, he was advanced to gang foreman, two years later being promoted to general foreman at Fort Wayne, Ind. In October, 1913, Mr. Eisele became general foreman of the main locomotive shop at Decatur and in December, 1917, was promoted to superintendent of that shop. He was promoted to assistant superintendent of the locomotive department on the staff of the superintendent of motive power of the Wabash, with headquarters at Decatur, on April 1, 1920.

FRANCIS W. JOHNSTONE, former superintendent of motive power and machinery of the Mexican Central (now part of the National of Mexico), with headquarters at Mexico, D. F., died at San Diego, Cal., on October 17 at the age of 82 years. Mr. Johnstone was born at Charleston, S. C., and entered railway service in 1874 as a draftsman at the Wilmington (Del.) shops of the Philadelphia, Wilmington & Baltimore (now part of the Pennsylvania). Later he served with that road as a machinist and until 1884 he was engaged successively as a draftsman and machinist on the Panama Railroad at Aspinwall, as foreman of the shops at Aspinwall, as assistant master mechanic and master mechanic at Aspinwall, as master mechanic of the Springfield, Jackson & Pomeroy (now part of the Detroit, Toledo & Ironton), and as master mechanic on the Mexican Central. In April, 1884, Mr. Johnstone was promoted to superintendent of motive power and machinery of the Mexican Central, a position he occupied until his retirement from railway service in August, 1901.

EDWARD LANGHAM, formerly general purchasing agent of the Canadian National, with headquarters at Toronto, Ont., died in that city on September 4. Mr. Langham was born in England 77 years ago and entered railway service in 1875 on the New York Central at Rochester, N. Y. After service on several small coal railroads in Pennsylvania, he entered the employ of the Canadian Pacific in 1882 in the handling of construction material at Winnipeg. From 1886 to 1902 he was engaged successively in handling construction material for the Canadian Pacific in Maine and at Calgary, Alta., and for the Toronto Railway; as purchasing agent for the Birmingham (England) Tramways, and as material agent for the Canadian Northern (now part of the Canadian National) at Winnipeg, Man. In 1902 Mr. Langham was promoted to purchasing agent of the Canadian Northern at Winnipeg, 15 years later being promoted to general purchasing agent. He retired as general purchasing agent of the Canadian National in December, 1920.

H. L. HARVEY, superintendent of motive power of the Chicago & North Western, with headquarters at Chicago, died at his home at Oak Park, Ill., on September 19, following a three-months' illness. Mr. Harvey had been connected with the North Western during his entire railroad career of 30 years. He was born on July 9, 1874, and obtained his first railway experience as a locomotive fireman on the North Western in September, 1899. Seven years later he was promoted to engineman and he was then advanced successively through the positions of traveling fireman, trainmaster and assistant road foreman of engines. In August, 1917, Mr. Harvey was promoted to master mechanic of the Iowa and Minnesota division, with headquarters at Belle Plaine, Iowa, where he remained until August, 1918, when he was promoted to general fuel supervisor, with headquarters at Chicago. He was further promoted to assistant superintendent of motive power, with headquarters at Chicago, in December, 1919, and had been superintendent of motive power and machinery since September, 1927.

H. L. Harvey

R. D. HAWKINS, general superintendent of motove power of the Atlantic Coast Line, with headquarters at Wilmington, N. C., who died on August 7, was born on May 22, 1873, at Lafayette, Ind. He was a graduate of the School of Mechanical Engineering at Purdue University in 1893 and entered railway service in August, 1899, with the Great Northern as chief draftsman. Later he served successively as mechanical engineer, general master mechanic and assistant superintendent of motive power. He became superintendent of motive power on March 10, 1910. On October 20, 1917. he entered military service and was commissioned lieutenant-colonel, being assigned to Russia with with the Railway Engineers. While in Russia he was given command of the Mechanical Section of Railway Engineers under the command of Colonel Emerson. Mr. Hawkins returned to the United States on January 5, 1920, and was appointed an assistant to the president of the Great Northern, doing special work in connection with mechanical matters. On September 15, 1920, he was appointed general superintendent of motive power of the Atlantic Coast Line.

R. D. Hawkins